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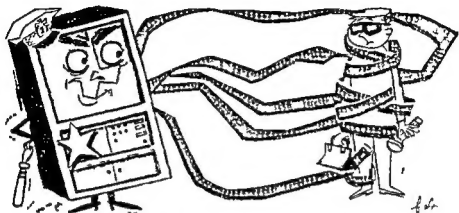
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# Can Science Control Crime?



**There is little a criminal can do against some of the newer crime-fighting instruments**

by Gene Bylinsky

Condensed from *The Wall Street Journal*

**A**N ELDERLY SAFECRACKER currently contemplating scenic San Francisco Bay through the bars of the massive state prison at San Quentin owes his predicament to the electronic age. He was nabbed by an I B M machine.

The burglar was tracked down through his so-called trade mark—hiding in a place of business during the day and attacking its safe at night.

After a rash of similar safe cracking jobs puzzled police in southern California, an I B M data processing machine at the state's crime laboratory slipped through some 10,000 punch cards and came up with a dozen burglars who specialized in 'inside' safecracking. With the

search narrowed down, the police questioned suspects and found their man.

This incident points up just one way in which science increasingly is being put to work to fight and prevent crime. In their laboratories, criminologists are developing new techniques and instruments to trap or deter criminals. And policemen are receiving broader and more intensive training to familiarize them with the new developments.

So far, however, such efforts have not stopped the recent increases in crime. In 1958, the latest year for which complete statistics are on hand, 8,182 Americans were murdered, 75,347 robberies took place, and 270,965 automobiles were stolen. These and other major crimes were up 9.3 percent from the previous year. In the first nine months

last year the FBI reports major crimes increased by 7 percent.

FBI Chief J. Edgar Hoover estimates that crime cost Americans \$22 billion last year. Many crimes go unsolved; only a small fraction of stolen cars were recovered, for example.

I hate this crime doesn't pay stuff," scoffs Dr. Paul L. Kirk, a noted criminologist and professor of criminalistics at the University of California in Berkeley. "Crime in the U.S. is perhaps one of the biggest businesses in the world today."

The use of scientific devices, of course, is not exclusive with police; they generally are available to criminals, too. Walkie-talkies and radio cars, to cite two examples, are being used with more frequency in carrying out crimes. But frequently there is little a criminal can do against some of the newer crime-fighting techniques and instruments.

Consider Radar Guard, an electronic alarm system made by the Bay State Electronics Corp. of Boston. Radar Guard is a small instrument that detects motion within its 50-foot reach. Donald F. Cutler, Jr., president of Bay State, declares that "a mouse might not set it off, but a cat will." When the device is triggered, it starts a bell or siren and flashing light that can be rigged up to go off on the spot or miles away in police headquarters.

Put yourself in a burglar's position, suggests Cutler. "A blinding light suddenly goes on and a

siren begins to wail. We've had cases where burglars jumped out of windows breaking legs when that happened."

Some 8,000 Radar Guards are now installed around the country.

Closed-circuit television systems are being installed in many retail stores around the country to spot shoplifters. In these systems, cameras are hidden at strategic spots around a store and the pictures are monitored at a central place by a guard trained to detect suspicious movements. Now police in Salt Lake City are considering installation of closed-circuit television in crime-infested areas of the city.

IN ONE important crime-fighting field—physical evidence—microscopic data that previously was too minute to be examined is being scrutinized by electronic microscopes that enlarge objects 100,000 times far greater than the 2,000 times magnification of conventional microscopes. Tiny specks of paint, glass, metal and dirt frequently provide the clues that tie a suspect to a crime scene or clear an innocent person.

A criminal can't help but leave physical evidence, or take it with him, says the University of California's Dr. Kirk. "And physical evidence isn't ambiguous like human testimony. It either matches or it doesn't."

Criminals often trip over seemingly insignificant evidence. A young thief, also a current resident at Saugustin, stumbled over a jar of bright red paint while burglarizing

a dime store. Arrested as a suspect, he was found to have a tiny speck of red paint on his shoes. The paint, analyzed by state criminologists, matched with the paint in the store's container.

A piece of rope that tied three sticks of dynamite hurled into the yard of a Berkley Calif. resident, yielded this string of evidence clinging to the rope were tiny round grains of sand and a few animal hairs. This suggested to criminologists that the rope might have been used on a farm that had a fast flowing stream (since flowing water rounds sand grains). Recent dynamite purchasers were checked and one was found who lived in such a place. He turned out to be the bomb thrower.

Cashing in on the expanding market for crime detection equipment, Minneapolis Honeywell Regulator Co. maker of automatic control systems and instruments a few months ago introduced a series of elaborate security devices for industrial plants. These include the Vitronic, a light sensitive instrument that can detect motion at up to 2,000 feet and automatically set off an alarm and the Sono Sentry, which works about the same way except that it's based on noise detection.

Minneapolis-Honeywell is also offering a closed-circuit television door or gate-opening control panel system. Under this system a guard at a central location can monitor pictures taken at a number of entrances to a plant, if an arrival is

known to the guard or identifies himself satisfactorily, a simple press of a button can open the gate or door electrically. Another Minneapolis Honeywell device is known as a security control panel. It automatically receives signals if a fire breaks out in a plant or if a burglar tries to enter through a door or window which is guarded by magnetic switches. The panel can protect areas up to 20 miles away, the company asserts, and can be monitored by one man in an instrument filled room.

ONE AREA of scientific research that some criminologists think could conceivably have far reaching effects in crime prevention deals with the ionization of air. The air we breathe is made up of molecules of gas—mainly oxygen, nitrogen and carbon dioxide.

Certain natural phenomena such as cosmic rays cause a small percentage of these molecules to lose or gain electrons. Those molecules that gain electrons are known as negative ions and those molecules that lose electrons are known as positive ions. Both positive and negative ions are being formed constantly in nature.

In recent years scientists have discovered that ionized air has a profound psychological effect on many persons. Generally, positive ions seem to make people depressed or irritable and negative ions make them optimistic. S. J. Curtis, security superintendent of J. L. Hudson Co., a large Detroit



store has studied ionized air with the thought that it might be used in big stores to discourage shop lifting

Curtis notes that in Germany 'there are periods of the year when they have what are called the Fohn winds. They come in across the Alps. During the period of the Fohn winds there is a serious increase in crime. Analysis of these winds has shown that they have a high positive ionization. The same probably occurs in Italy. In Italy they have the period of the Sirocco winds. Again there is a tremendous increase in crime during this period.

According to Curtis the police department in a large Eastern city has been conducting research on ionized air for the last two years. The department believes there is a correlation between positive ionization and crime, he says. Similar studies have been made by police in San Francisco with a similar conclusion. Curtis asserts:

'Some day we may be able to control crime by charging air with negative ions,' Curtis says. "A retail store can create negatively ionized air fairly inexpensively. Both Philco Corp. and Radio Corp. of America have poured a lot of money into ion research.

Soon it will be possible to put ionizing equipment into air conditioning ducts to negatively ionize the air in a store. Indications are that this will reduce the problems of shoplifting and internal theft.

It remains to be seen, however, whether ionized air would deter a

criminal who walked into a store with a carefully conceived plan for a theft.

In the field of communications science has enabled police to send vital information from one city to another in a matter of minutes. For example, a wirephoto system now links 27 law enforcement agencies around the nation, rushing blown-up fingerprints between distant points for quick identification.

Fingerprints still play an important role in nabbing criminals but as one criminologist puts it, "only a fool commits a burglary these days without gloves." This shift in criminal tactics has created a pressing need for new methods of identification—another area of scientific research.

**S**TEP INTO the University of California School of Criminology to see one new identification technique under development. White smocked lab technicians work at 'fingerprinting blood.

A tiny blood sample is placed on a strip of special paper inside an apparatus similar in shape and size to a cigar box. An electrical field breaks the sample down into components, making a distinctive pattern on the paper. The pattern varies with each individual's blood, researchers explain.

Under present methods, crime experts can determine only a person's blood group. With the new technique they hope to tell whether trace of blood came from a specific individual. Criminals are

injured and leave drops of blood at the scene of a crime it is noted

Human hair too is coming under closer investigation as an identification means. By scrutinizing a single hair criminologists already can tell a person's sex, race, approximate age and other information.

To help assure the wider use of new crime fighting devices and the application of new techniques more states and cities are opening or expanding training centers for police men and detectives. Larger cities long have provided training facilities for their policemen but in smaller cities rookie policemen usually have

had to learn their jobs from older hands on the force and many of these veterans were not well informed on up to date procedures and techniques.

• • •

New York last year became the first state to make training for policemen mandatory and New Jersey now is considering similar legislation. California now provides funds to municipalities which accept state standards of training for their police forces and the Chicago based Council of State Governments recently called on other states to adopt such laws.



### "Atomic Spotlight" Used in Study of "Biological Timeclocks"

A new atomic spotlight is being used by scientists at Argonne National Laboratory in Lemont, Ill. to study the physiological time clocks existing in all body cells.

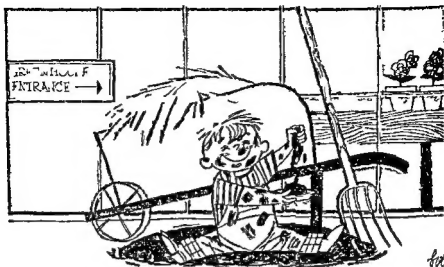
The spotlight, actually the largest biological spectrograph of its type, can aid in determining the reactions of living organisms to different wavelengths (colors) of light. It was built by Dr. Charles I. Ehret of Argonne's staff.

Recent evidence points to the presence in cells of chemical compounds which somehow regulate physical needs such as the desire for sleep. Every complex living organism has a natural timetable that apparently is regulated by these mechanisms, Dr. Ehret said. For example, a person traveling by

plane to a distant part of the world would be required to alter his eating and sleeping habits to conform to the different day-night schedule and would feel uncomfortable until his 'time clock' adjusted to the new environment.

In order to learn more about the nature of this time clock mechanism, Argonne scientists are exposing one-celled animals called paramecia to different wavelengths of light at various times. They have found that the 'clocks' can easily be reset by exposing the animals to ultraviolet light.

Once we understand the chemistry of nature's time clocks, we will have a way to probe the mechanism that controls wakefulness and sleep, Dr. Ehret said.



# The Scratch That Kills

by Edward R. Bloomquist, MD

Condensed from *Today's Health*

**T**ETANUS is a dying disease in the United States but it certainly is not dead.

A yearly average of 501 Americans were stricken with this disease between 1950 and 1954. 352 of them dying each year from its effects. In 1955 the last year total statistics were available a welcome decrease occurred. But despite increasingly effective treatment being developed for the problem 265 or 57 percent of 1955's 462 victims still forfeited their lives.

Often referred to as lockjaw tetanus doesn't have much of a chance to work its mischief in major injuries. For these cases—gunshot

wounds compound fractures, industrial accidents—are usually seen a doctor and tetanus immunization started before the germ has a chance to produce its deadly toxin.

More than half of American tetanus cases occur with minor injuries—rose thorn pricks insect bites cuts power tool wounds or splinters. These minor wounds are so common and inconsequential they are not usually associated with tetanus until it is too late.

We have to live with *Clostridium tetani* the lethal germ that causes lockjaw. It is a normal and important inhabitant of animal tracts particularly those of horses and cattle. Its spores become mixed with earth and subsequently

found almost anywhere. No one is immune from the germ's effects, even those who recover from the disease it produces unless immunity has been obtained by inoculation.

Death is always a tragedy. Death from tetanus is doubly so. With potent protection against its effects, the disease should no longer plague us.

Fortunately, a large segment of our population has been immunized against lockjaw. It is this group's immunity that has helped keep the number of tetanus cases reported each year at the figures previously mentioned.

Since 1950, nearly every child has been given 'triple shot' (diphtheria, tetanus and whooping cough) by his family or school physician. Recently, a fourth injection, polio, has been added to this group.

Military personnel who have seen service since 1940 have also been immunized against tetanus for war brings men into earthy contact with wounds that may be contaminated with tetanus.

On the surface, this should mean that a mass of Americans are immune to lockjaw.

But it doesn't.

War is hopefully a thing of the past, and the size of our military has been decreased. Children rapidly mature and leave the grade school age where immunization is stressed. Although both groups retain an immunity for some five years after their immunization series, this immunity tends to disappear unless a booster is obtained.

Preoccupied with other things,

and often lacking the information that boosters must be continued every five years for life, many people have neglected to keep their immunity current. As a result, their bodies' ability to fight the tetanus germ begins to wane. When they need it most, they may find their body lacks this vital protection.

SOME SECTIONS of the country have had more difficulty with tetanus than others. The South, for example, accounted for more than a third of all American tetanus deaths recorded in the last survey.

The majority of these deaths occurred among the nonwhite population. The heaviest toll here was among infants born outside hospitals, attended by nonphysicians in less than sanitary conditions.

Tetanus, however, is not confined to one area. Nor are its victims selected from any particular racial group. Recognizing this, Morris County, New Jersey, physicians planned an all-out campaign last August to immunize as many of their fellow citizens as would cooperate.

During this same month, the Los Angeles health department warned that their city was facing its worst tetanus outbreak since 1950. They recommended everyone receive protection against the disease as soon as possible. For, although Los Angeles can offer its citizens the best in modern medical care, the disease was taking a regrettable toll. Of 11 cases occurring through September 1959, seven of the victims died.

"From the standpoint of deaths caused" Dr H H Cowper director of Los Angeles Communicable Disease Control Division recently commented "tetanus toxoid injections are more important than polio vaccinations"

This was an interesting comparison. For tetanus and polio have at least three things in common. Both can be eliminated by controlled pro-



grams of mass immunization. Both have continued to kill because immunization is not complete throughout the country. And both are killers of youth. Aged or debilitated persons are less likely to recover from an attack, but children are more likely to be exposed to the germ.

Over a period of 20 years, 66 percent of patients who died from tetanus were under age 45. The only downward trend significantly, was seen in youngsters under age five who have routinely received tetanus immunization.

Unlike many of the killer germs, tetanus cannot thrive in oxygen. Its chance to work its mischief is lost unless the germ is carried beneath the surface of the skin and to an area of low oxygen content.

If a wound is well cleansed and encouraged to bleed for a brief moment after injury, tetanus is less likely to occur. When the germ is imbedded, however, particularly if it can grow in dead or dying tissue

(burns, for example), ideal conditions exist for its growth. Rapidly multiplying, the germ begins producing a toxin which in a short time travels to the brain.

Unfortunately, a wound contaminated by tetanus lacks any special characteristics. In fact, the wound may heal long before tetanus appears. Buried beneath the skin, tetanus is unsuspected until the toxin's effects become apparent. This may happen within 48 hours of injury. Generally the earlier symptoms occur, the less the chance for survival.

When tetanus strikes, its victim (usually a male, frequently a child) notices a beginning muscular stiffness and soreness. This usually happens some 12-14 days after a wound is contaminated by the germ. The symptoms indicate the toxin has already reached the brain. In a short time it becomes difficult to walk. Headache and insomnia appear, followed by convulsions.

To doctors facing a life and death struggle, a disturbing fact is always present. This miserable aftermath of an otherwise simple wound would never occur if people were immunized and would keep this immunity up to date.

Protection against tetanus can be obtained by one of two methods: active or passive immunization. The first toxoid stimulates the body to form its own defense and is valuable if taken before injury occurs. Passive immunization (antitoxin) is transient in contrast to toxoid, i

fects disappearing within six to eight weeks. This approach is used after injury has occurred to a person not previously immunized with toxoid.

Toxoid is administered in a series of three injections. The first two are given a month apart, the third a year later. To keep immunization current, a booster must be obtained in approximately five years. If more than five years have elapsed, the entire series should be repeated.

When serious injuries occur, a toxoid booster is all that is usually needed to assure immunity. When a booster is given for an injury, the necessity of having another booster is moved forward for another five years unless tetanus contamination occurs in further wounds.

This does not necessarily mean that every scratch or splinter is an indication for a tetanus booster; for the series if kept up to date tends to protect against tetanus in small injuries. If there is any question, however, you should consult your doctor.

World War II proved the effectiveness of toxoid. During this period 2,800,000 wounded service men received booster injections of toxoid at time of injury, their immunity having been guaranteed by previous injections of toxoid.

Only 16 cases of tetanus occurred. Of these, six had missed their basic immunization and there is some question about the others. Toxoid has no unpleasant side reactions. In a special study of 25,000 inductees checked by army physicians, not a

single significant side reaction was noted.

Passive immunization is the only available protection when a tetanus-contaminated wound occurs in an individual not previously immunized by toxoid. Toxoid is of no value at this time because it takes more than a month for it to stimulate the body to build its own defense mechanisms. Toxoid is given at the same time as antitoxin, however, since the latter loses its effectiveness in less than two months and tetanus may still be present. The toxoid series is always followed through, another injection being given in a month and again in a year.

ANTITOXIN has certain problems not present with toxoid. Approximately 25 percent of persons who need its protection are allergic to the horse serum which serves as its base. This sensitivity is always determined by a simple skin test before antitoxin is given. A small amount is injected under the skin. If allergy is present, a wheal surrounded by a reddened area develops. Since allergy can be a seri-



ous problem, the antitoxin must be carefully given in divided doses over hours, or in the severely allergic days. And of course, valuable time is lost.

In addition to allergies, the

others to whom toxoid immunization is especially important. Although everyone should be immunized against this disease, certain groups are playing with fate if they avoid this protection.

Among them are

*Children* whose intimate contact with mud associated with a variety of recurring cuts and scratches makes them prime candidates for lockjaw. Immunization is a must before school or summer camp as well as in infancy.

*Gardeners and do-it-yourself enthusiasts* who are forever cutting, scratching, nicking or gouging themselves with tools contaminated with earth or fertilizers.

*Industrial workers* whose power tools are frequently contaminated

by tetanus germs and whose exposure to injury is greater than average.

*Ranchers and farm* whose constant association with horses creates an additional —allergy to horse serum from constant association with the animal. In addition, work involved in professions offers constant exposure to tetanus-contaminated implements.

*Military personnel*. In a national emergency these men and women are the first to be called to duty; the first to be exposed to injuries in which tetanus thrives.

Tetanus is a killer—an unnecessary menace that can be eliminated by inexpensive immunization obtainable at every physician's office. Immunization can save your life.

## No 'Towering Crags' on Moon?

A NEW PHOTOGRAPHIC technique has shown the surface of the moon is far less rugged than previously believed. The photographs are part of the Air Force's Cambridge Research Center lunar exploration program.



The project, begun in February 1958 and resulting in about 5,000 moon photos, makes use of timing instruments to record the march of shadows from various prominences across the face of the moon.

According to Charles F. Campton, the program's director, the pictures generally indicate that steep slopes and towering rock faces are absent from the lunar surface.

Campton said that a man standing on the surface of the moon would see a flat horizon without the immediate towering crags often portrayed by artists who worked from previous concepts of the moon's face. The Air Force

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Langland and the Pic-du-Midi Observatory of the University of Toulouse, France, cooperated in the project.

# It's Twister Time, Again

Weather Bureau hopes to find a way to control tornadoes



by Ann Ewing

THE WEATHER BUREAU is this year intensifying its search to find a way to control tornadoes.

Doctor F. W. Reichelderfer, Bureau chief of his agency, and other meteorological organizations are stepping up their research to find out whether it is possible to control or modify tornadoes so their paths could be changed or so they could be totally suppressed.

Weather scientists are also looking for better methods of forecasting when and where tornadoes are likely to occur. Each year the predictions of areas where conditions are ripe for tornadoes to strike show greater accuracy, but Weather Bureau me-

eteorologists will not be satisfied until pinpoint forecasts are a reality.

The tornado season is now at hand. Some 68 percent of the U. S. total occur during the four months between April 1 and July 31.

Most twisters strike between noon and midnight, but they can occur at any hour.

Definite weather patterns are needed to spawn tornadoes. The viciously rotating column of air drops down from a line of thunderstorm clouds to level any structures in its path. It is a gray or black funnel-shaped cloud that spins like a top. When nearby, a tornado sounds like the roar from hundreds of airplanes.

Whenever the air is moist, dry and cool

the air is warm, the air is for sup



acy, the stage is set for stormy weather. If other factors are right, the resulting thunderstorms may give birth to a tornado's whirling funnel.

### Squall Line

One factor is a big temperature difference between the tropical air and the colder air, such as temperatures in the high 90s ahead of the cold front in the 60s behind it. Such a sharp cold front usually means a line of thunderstorms, or squall line, is established.

A pulse, or "pressure jump line" is sent out ahead of the squall line, most weathermen believe. The pulse sets up a vertical motion to help release the pent up energy of the warm air.

High in the atmosphere there is often a swiftly moving jet stream, usually from the west, bringing with it drier, cooler air.

The required conditions occur much more frequently in some areas, particularly the country's midsection from Texas to Ohio—a section



known as "tornado alley"—than in the Northeast or Far West.

The width of the path over which the tornado funnel causes such damage averages less than 1/4 of a mile, and the length is usually 10 to 40 miles.

The destructive effects of tornadoes are terrifying.

Tornadoes can lift freight cars. Strong buildings are torn apart and scattered about like kindling wood. Large trees are uprooted and bark stripped off. People and farm animals are whirled through the air and then dashed to earth. Strands and slivers of wood are driven into boards and posts.

From such effects, weathermen have estimated the wind speeds within tornadoes are as high as 100 miles per hour.

### Safety Measures

The safest protection from an approaching tornado is to be underground, such as in a tornado cellar. When underground protection is available, stand against the inside wall on a lower floor of a strong, reinforced building. In homes, the corner of a basement toward the tornado usually offers greatest safety, particularly in frame houses.

In open country, move at right angles to the approaching tornado. If there is not time to escape, lie flat in the nearest ditch or depression.

The Weather Bureau alerts the public to tornadic conditions by issuing a tornado forecast. This is an advance notice distributed through newspapers, radio and television stations, specifying areas where one or more tornadoes can be expected to occur. The usual size of such a forecast area is about 20,000 square miles, equivalent to an area 100 miles long and 100 miles wide.

The forecasts are issued to all volunteer storm reporters, police and the public to watch for tornadoes.

ie sky becomes threatening. Preliminary action can be taken so that place of safety can be reached quickly if it becomes necessary.

A tornado warning is an announcement that a tornado has been sighted and mentioning localities in the storm's path where immediate safety precautions should be taken.

The importance of providing advance warnings to help avert catastrophes resulting from local storms can be appreciated when it is realized that the annual loss in the U.S. from hail, tornadoes and thunderstorms is estimated at many millions of dollars for each of these types of severe weather conditions.

To help provide detailed advance warnings, networks of observers have been organized in some communities in areas most subject to destructive local storms.

Also helpful in spotting tornadoes is a network of radar stations.

Lightning discharges, known as 'sferics' from a contraction of the word 'atmospherics', give another

method of tornado detection are the Air Force, the Federal Aviation Agency and the National Aeronautics and Space Administration. Each agency is contributing planes and equipment. Dr. Reichelderfer said:

Besides airplanes, rockets and on the spot detecting devices, meteorologists use every possible research tool to study the swirling storms. Their methods range from miniature tornadoes made in laboratory boxes

to complex mathematical formulas fed into electronic computers.

### Path Is Narrow

One reason so little is known about tornado formation is the relatively small scale of their occurrence. The distance separating present Weather Bureau operating stations is about 200 miles, while the storm's destructive path often is only about 1/10th that distance. Even under good conditions, therefore, it is unlikely that



a trained meteorologist would observe the birth, growth and death of a twister's funnel.

To fill this gap, the Weather Bureau is developing a stepped up spy system.

Ground observations from stations in a close network have yielded some information about squall lines, the long lines of thunderstorms and gusty winds from which the tornado's funnel swoops to the ground.

A sudden rise in barometric pressure for instance, always accompanies squall lines. Weather Bureau scientists have developed an automatic alarm device that signals when such a 'pressure jump line' crosses over it. Many of these devices are now in operation 24 hours a day in "tornado alley."

Flashing radar equipped simultaneously into the squall and more ground based radar are other prongs of the spy.

If a tornado develops in one of the squall lines that has been thoroughly probed weathermen believe they could detect in their records the factors that made the tornado bearing squall line differ from those in which no twisters occurred.

If one or more unique features that precede tornadoes were found then the atmospheric instability resulting in tornado formation might be checked by man before the destructive clouds start rotating.

Some kind of control is considered possible if more were known about the basic physics of clouds, how and why they form. Seeding the clouds with chemicals might be of some benefit. Other methods in the discussion stage include the use of large oil fires or very small explosions.

Behind all these suggestions is the idea of dissipating the storm's energy before it takes the form of a whirling funnel.



### List Three Heart Disease Factors

THREE FACTORS appear to influence the answer to the often asked question:

What kind of people are likely to get heart disease?

A research program known as the Los Angeles Heart Study now in its tenth year shows the three factors are:

- 1 An elevation in blood pressure
- 2 A family history of heart disease
- 3 Elevated blood cholesterol

The study has been carried out under the direction of Dr. John M. Chapman of the School of Public Health at the University of California, Los Angeles, together with Drs. L. S. Goerke and Leo G. Reeder, assisted by Mrs. Anne Coulson and others.

The project consists of a study of 1,859 men now or previously employed

They received detailed examination between 1950 and 1954 and since that time have been contacted annually to determine whether or not heart disease has been diagnosed by their personal physicians.

During the decade 135 have died from various causes including 59 from coronary heart disease. A total of more than 100 cases of this disease has occurred including the fatal cases. The incidence is highest among the men who had high blood pressure, a family history of heart disease, or elevated blood cholesterol.

There did not appear to be any relationship between the type of work or socioeconomic status of the individual in the development of heart disease. The disease struck alike among those in executive positions and in unskilled labor, among those in sedentary jobs and those involving heavy work.

*Do you reveal yourself by what you tell?  
—in boasts? coy hints? shy half-truths?*



# Why We Talk About Ourselves

by Barbara Moon

*Condensed from Maclean's Magazine*

ONLY MAN of all the animals, is abashed and secretive. There are things he cannot or will not reveal about himself even to his vital kin—his parents, his mate, his brothers and sisters, his children. For the rest of the world he edits himself with still more compulsion and cunning. In fact, everything he thinks, feels, believes, and remembers, he also considers. None of Somebody's Business.

Yet he seems also possessed of a furtive urge to make himself known. In freakish hints, in contagious bull sessions, in aggressive boasts, in coy parables or jests that cloak truth in shy confidences and in tortured con-

the record

straight. It is as though the finally intolerable thing—and never mind his privacy—is to feel himself misunderstood.

Why do these twin urges war within him? What kinds of things do people conceal about themselves? Why? Who do they talk freely to? Who should they talk freely to? How much should they tell?

Most people are only fitfully aware that there is an inner clash. The sole symptom may be a tiny moment of puzzled irritation or discomfiture. Why on earth couldn't I come right out and admit the truth? Or, on the other hand, 'Now what made me tell that?' Or it may catch their attention by the anomaly of dislike for the confidante that often follows the luxurious heart-to-heart talk.

Ever since Freud, students of the human personality have been convinced that our patterns of self disclosure are crucial. In fact classic psychoanalysis is based on the premise that mental sickness resides just in what we keep secret—and that the cure is to talk about it. And talk. And talk.

Yet, talking readily even about personal things is not total self disclosure. Psychiatrists know that some material is so painful for a patient to dig out of himself that he will fall into lies and abuse, spend whole sessions in stubborn silence or threaten to discontinue treatment rather than put it into words.

While most people are eager to talk about themselves they will keep from one person what they will reveal to another. A man will speculate about the new blond in the office with his co-workers but not with his wife. He will tell his wife details of his college carousals that he would never tell his parents.

He will tell his parents he is having to borrow money but will do all he can to hide it from his golf partner. He will indulge in florid accounts of his past to his golf partner but not to his son. And he will tell his son of his love for poetry though he thinks he would sooner die than admit to his co-workers that poetry can still move him to tears.

A little over two years ago Sidney Jourard, an associate research professor at the University of Florida, undertook studies of what people are willing to reveal—and to whom.

The following are some of his findings.

*Mothers* are generally the closest confidante of unmarried young people, sons or daughters,

*Females* also confide in their girlfriends and males in their male friends but females tell least about themselves to their beaux, and male to their girl friends,

*Married men and women* transfer their confidence from parents to spouse but don't tend to increase the number or depth,

*Most people* will talk willingly about their attitudes, tastes at work, the majority are reticent about their financial affairs, the personality and their bodily functions and appearance.

*Women* disclose themselves more than men.

### 3 Basic Drives

The literature of the human personality suggests there are at least three drives that prompt people to talk about themselves.

The first—and the most time honored—is *catharsis* that gush of relief and release after a confession heard.

confession that he'd cheated as quiz contestant on the TV quiz "Twenty One." They also heard him say, "This is the first time I've felt happy for three years." Many people have found that secret guilt is a blackmailer and that publishing the blackmail themselves is the only release from a frightened eternity of paying.

The second motive could be called *hibitionism*. It is the need for estige, the need to make a mark, get attention sympathy love

confider feels confirmed in his self analysis and freed of his fears of being unattractive or—worse—unnatural. Most heart to heart talks and bull sessions send the talkers home a little more sure that what they are is after all all right

• • •

oms boasts are of this order. It is notive that s capable of sweeping ide even the simplest caution. Artie Newman, a member of the torious Birger gang that terror d southern Illinois in the twen s, once started trading anecdotes th a stranger on a transcontinental an. The stranger talked very big out guys being bumped off and her guys taken for a ride. New an began topping him. The stran r was a reporter, Pulitzer prize inner John T. Rogers of the *St ous Post Dispatch*. Newman and n of his gang were convicted of the o murders hed bragged of to ogers.

The third motive is *self under anding*. It's as though putting elings into words helped them rke sense begin to seem normal. he confidante's reaction can com lete the process. If he is un ocked unsurprised unpuzzled the

The need for recognition may keep people mute as well as driving them to talk. they will hide infor mation about themselves that might lower their prestige or prevent their raising it. This seems to be the mo tive behind the universal—and init ally puzzling—reticence about in come. People will tell how they voted in the last election, how they cheated on a college exam, and why they nearly committed suicide. But to have others know the s ze of their salary seems as threatening as though it were in literal truth the measure of what they re worth.

There is one other area of reti cence so deep rooted and instinctive that it seems linked with a kind of self preservation. This is the ex perience of mental anguish or out rage so severe that it cannot be faced.

A book editor said recently: "The

## SCIENCE DIGEST for CLASSROOM USE



MANY TEACHERS and students find SCIENCE DIGEST a stimulating classroom aid in the study of the latest scientific developments. To encourage this use of the magazine the publishers have established special prices for classroom quantities. Teachers who would like more information should write on their school letterhead mentioning their department and subjects taught to Science Digest School Department, 250 W. 55th Street, New York 19, New York.

one thing I've never been able to discuss with anyone was something I saw once as a child. It was some one torturing an animal in an unbelievable way. It's as though if I put it into words it would make it real."

In the same way soldiers returning from battle will say, 'I don't want to talk about it.'

Humiliation seems to tap the same self protective instinct. Annette Garrett, a social worker, reports the case of a boy who was being counseled because he'd quit school. The boy admitted without probing that he'd once got into trouble for pilfering, but only with skillful and patient questioning and after many false starts could he blurt out his most painful secret: he wouldn't go to school because his mother had made his underwear from her own cut-down bloomers and wouldn't risk being seen in them in the washrooms or gym locker room.

Why didn't the boy tell his mother instead of the counselor? 'She'd feel real bad because she knows we haven't any money to get underwear,' he explained.

The decision to spare someone is part of the urge to be worthy of approval. For, though the evolution of inhibitions is infinitely complex, one way of describing it is as a gradual process of learning what people do not want to hear and obediently keeping it from them.

It starts in babyhood. If what the child reports about himself brings too much anger from his parents he will stop reporting it.

So he learns to suppress—and feel guilty about—his destructiveness, his jealousy, his curiosity, occasional impotent hatred of parents, his lies, lusts, cruelties, stupidities. It is "sins" such as these—smothered, festering unacknowledged—that may bring him to the psychoanalyst's couch in later life.

Soon the child learns to screen his confidences not only according to what behavior will bring approval or displeasure from his parents but also according to their views on what is welcome to the world at large. "We don't tell people much of my age." "We don't say granny had to go to a nursing home" or, simply, 'We don't talk about that!'

### Teen-Age Talkers

The child also absorbs his parents' explicit training about expressing himself. A boy will be taught that it's not manly to complain. A girl will be taught that her traditional role is to listen sympathetically.

By adolescence, most children start to find outlets for the confidences they feel they can't bring to their parents. For the urge to be worthy of approval wars with the instinctive need to be accepted, with problems, fears and all just as they are.

They test their friends with even narrowing generalizations for signs of shock or ridicule or apathy. They blurt out the contraband thoughts their mother has a martyr complex, they've decided or she has this me habit of sitting tight lipped.

ickly at dinner without ever say  
; what they ve done wrong Then  
the cathartic realization that  
ch disloyalty is not just permis  
le but epidemic in the whole  
oup Here they feel they can  
andon pretense

But even as his friends help eman  
ate him the friends themselves  
rn into tyrants The intelligent  
l must never talk about her  
arks or she won't be popular The  
y must not admit he likes the  
ench teacher whom everyone else  
nsiders a fool The taboos differ  
th education income level race  
ckground religion locale but by  
e time they reach their 20s most  
ople know what others expect  
om them

They present it economically and  
ficiently trying to volunteer noth  
g that would intrude on say the  
ss's concept of a secretary the  
TA's picture of a charming matron  
ie golf club version of the rugged  
ale

For the most part people find that  
lk of their personal problems is  
welcome particularly outside the  
ome Don't tell me your troubles  
perhaps society is most devastat  
ig sanction

### Confidences In Marriage

Tangled in the cat's cradle of ac  
quired reticences and imposed bans  
most people keep looking for some  
ne to emancipate them from the  
roup just as the group once eman  
ipated them from childhood They  
ook for someone with whom they  
an just be themselves

Ideally this is the person they  
marry but that's not always quite  
the way it is Even in well adjusted  
marriages says sociologist Erving  
Goffman We expect that each part  
ner may keep from the other secrets  
having to do with financial matters  
past experiences current flirtations  
indulgence in bad or expensive  
habits personal aspirations and  
worries actions of children true  
opinions held about relatives or  
mutual friends etc

Ill adjusted marriages not only  
foil the basic needs for self expres  
sion but themselves create problems  
and emotions that cry for outlet

Sometimes the partners can tell  
each other the truth about these only  
in moments of anger so convulsive  
that it sweeps away inhibition  
Sometimes not even then can they  
communicate

It's when all appropriate confi  
dantes seem to threaten the punish  
ment of anger distaste or refusal  
that people turn to strangers—to  
the hired listeners like hairdressers  
barkeepers or cabbies the profes  
sional confidantes like poll takers  
or reporters or ghost writers or to  
the motherly Marv Worth figures  
who offer their interest and their  
ear

They're neutrals so they are non  
threatening and one way or an  
other even if it's only because  
you're paying them they're guaran  
teed to hold still long eno  
listen Otherwise they fall p  
short of the social scientist's  
tion of the ideal confidante

As Jourard the pioneer



disclosure research, puts it, "Actively accepting, empathic, loving, non-punitive responses—in short, love—provide the optimum conditions under which man will disclose, or expose, his naked, quivering self to our gaze." Psychiatry's substitute is, of course, the psychoanalyst.

### Does Talk Help?

Does telling strangers—even psychoanalysts—do any good?

What it depends on oddly enough is how hard it is to tell. The man who buttonholes the barkeep, his best friend, his golf partner, his sympathetic secretary and a whole series of neighbors to say his wife doesn't understand him is doing nothing for himself—and boring his fellows into the bargain.

For an interesting phenomenon is emerging as a new generation grows up, schooled in easy self-expression and the commonplaces

of Freudian thought, psychoanalysis is beginning to take longer. David Riesman, the U.S. sociologist who wrote *The Lonely Crowd*, notes that when talk along these lines comes cheap, analysis is often "intenable."

It seems that only when telling a shock—an emotional drama in self—does it do what is therapeutic: make us be ourselves and take look at what this is.

The man who, in agony, blurt out his nightmare fear of being coward in battle is stumbling or part of himself and facing it for the first time.

The woman who, in love, confesses she is ashamed of her body has abandoned glibness and pretense so that with help she can change herself.

For true mental health lies not in words but in self-understanding and in growth. It's just that sometimes the words help.

### Boiling Baby's Bottle Not Always Necessary

A PHILADELPHIA PEDIATRICIAN says that it isn't always necessary to boil baby bottles.

In an effort to relieve young mothers of all possible excess work, Dr. Carl C. Fischer, head of the department of pediatrics at Hahnemann Medical College, developed a safe and simplified method of infant feeding. His method of using evaporated milk and hot tap water from a city source received an enthusiastic response from volunteer mothers, says Dr. Fischer. Using hot tap water in the mixture saves time as it eliminates the need of reheating the bottle before feeding. The gains in weight of infants fed formulas so pre-

pared showed no statistical difference from those who received sterilized formulas. There were no evidences of infection in either group.

Bacteriologic studies showed that single feedings prepared from ster-

those similarly prepared with homogenized grade A milk showed an increased bacterial count.

Doctor Fischer emphasizes that this method should be confined to single feedings and all unused portions of each bottle should be immediately discarded.



by Jean Besse

Condensed from *The Unesco Courier*

## HOW MANY POSSIBLE HANDS IN BRIDGE?

53,644,734,400,000,000,000,000,000

ASK an electronic calculating machine how many possible hands there are in the game of bridge. It will be stone deaf to the question. First because the machine does not know what you are talking about. Second since it has no intelligence of its own (and that is why the term 'brain' is a misnomer) it is quite incapable of posing a problem much less of studying one. To pose a problem and solve it.

human brain

On the other hand you can very well ask a mathematician how many possible hands there are in bridge. After a few moments' thought, he

will tell you that the problem is one of calculating the permutations (the total number of changes in position or order possible within a group) of 52 objects (the cards) distributed in four groups (the 'hands') of 13 objects: the permutation of the objects within each group being immaterial.

In mathematics, the notation  $3!$  (known as factorial three) is the result of multiplying  $1 \times 2 \times 3$ . Likewise  $4! = 1 \times 2 \times 3 \times 4$ , and  $5! = 1 \times 2 \times 3 \times 4 \times 5$  and so on. The mathematician will tell you that the permutations of 52 objects is equivalent to  $52!$  (that is, the product of multiplying  $1 \times 2 \times 3$  up to 52). But we must also divide this number by the permutations within each of the four groups of 13: is  $13!$ , since the permutation

Jean Besse of Switzerland is a noted mathematician working with UNESCO's International Computation Center located in Rome. He is also a well known bridge champion of international standing.

in each group are immaterial. The number we are looking for is there fore

$$N = \frac{52}{13! \times 13! \times 13! \times 13!}$$

At this point and at this point only one could turn to the electronic calculator. There are a hundred tedious operations to be done.

*The machine is there just for that.*

But it is necessary to tell the machine precisely what is expected of it. For this a detailed 'program' must be worked out and recorded (assimilated) by the machine. After that you simply press a button and the result comes out a few seconds later. That is the miracle. There is nothing supernatural about it but it is a sensational accomplishment of technology.

For the problem we are considering I prepared a 'program' for the new Computer *Gamma Tabbour Bull*, built in France which took me

one hour to work out. The print answer emerged about a second after the button had been pressed. The number of possible hands in bridge

53,644 quadrillion

Spelled out, this figure precise only for the first nine digits is written

53 644 734,400,000 000 000 000 000 000

AS FOR the second question 'the possible distribution of cards to one player,' the calculation is simple and can be made 'by hand' with pencil and paper in five minutes. The answer

635 013 559 600 hands of cards

To 'program' this calculator and pass it through an electronic computer would be a waste of time. It is not worth the trouble to ask the machine to do a job that is too simple. Just as it is pointless to use a jet plane to cross the Champs Elysees.



## "Sea Serpent" May Be Giant Eel

THE "MYTHICAL SEA SERPENT" may not be a myth. It may in fact be a new species of giant eel.

According to a recent report to the International Oceanographic Congress, biologists have found a species

of eel larvae six inches long instead of the usual fraction of an inch.

This might mean that there are grown eels 100 feet long. To an untrained observer such a creature could be mistaken for a "sea serpent."



# Medical Symptoms Of History's Great Men

by Leonard Wallace Robinson

Condensed from *The New York Times Magazine*

IN THE PAST 50 YEARS the progress of medicine has been fantastic. The knowledge acquired in these five decades far outweighs the accumulated knowledge of the five thousand years that went before.

From their lofty modern pinnacle doctors look back in wonder at how doctors of yesteryear straightened out the medical record. These doctors, using up to the minute medical knowledge, have reviewed the signs and symptoms of disease in many famous historical personages and rediagnosed them completely.

The results are fascinating. Often such medical reassessment throws an entirely new light on a famous personality, his motives, his success or failure, his historical reputation. So many physicians are now engaging in this avocation that one doctor

felt it should have a name of its own. He dubbed it 'historio somatics' or, for diseases of psychological origin, 'historio psychosomatics.'

One of the most interesting contributions from this recent medical avocation is a rediagnosis recently made of Napoleon Bonaparte's manifold symptomatology.

## Napoleon's Slowdown

The puzzling thing about the Little Corporal was his mental and physical slowdown in his forties. Physicians of Napoleon's era ascribed this to two factors. They believed that Napoleon had stomach ulcers which caused him to have chronic "stabbing pains," and that he suffered from a contagious skin disease which he contracted during one of his campaigns. The suffering from these combined afflictions helped to deflect the emperor from his destiny. His energies were, thereafter sapped, according to

Using today's knowledge, physicians have reassessed the ailments of famous personages.

of the 19th century, by Napoleon's overeating and lack of exercise as he grew older.

There is little to such speculations, according to Dr James Kemble, famous English surgeon and a confirmed somato-historian. Bringing forth new evidence, Dr Kemble says that there were two major physical causes for Napoleon's indecision and the paralysis of his will. The first was a persistent acute infection in his upper urinary tract resulting in bladder trouble. The second was Froehlich's syndrome—a disturbance of the pituitary gland.

The type of bladder trouble Napoleon had was a debilitating affliction. The apparent paralysis of will that delayed him on the eve of Borodino was directly caused by it, according to Dr Kemble. Due to the same cause was Napoleon's unfortunate hesitation in ordering a retreat from Moscow while there was still time to get his army out of Russia and across the Berezina before the winter blizzards set in.

The bladder trouble was transient; however, Napoleon recovered from it. It was Froehlich's syndrome that was his Waterloo. This pituitary condition is a result of lesions of either the pituitary or hypothalamus. It is characterized by obesity and an affliction of the generative glands—and it caused Napoleon to have long spells of indecision and of moral and physical prostration in the years when he needed his very best energies.

Even so, he might have done better at Waterloo if the medical breaks had gone his way. On the eve of that great battle, however, Napoleon came down with an acute and agonizing attack of hemorrhoids. This was the final straw and led to his being fatally indecisive at the decisive moment of his history.

About the contagious skin affliction and the ulcers, Napoleon's "stabbing pains" were probably psychosomatic, not ulcers at all, and his famed "scabies" was unquestionably a nervous inflammation of the skin brought about by the enormous psychic strain under which he labored.

### Darwin "Bitten by Bug"

Another great man who according to modern somato-historians was medically misunderstood was Charles Darwin. The famous evolutionist though vigorous and healthy during his young manhood, became chronically ill at about 25. From then on he virtually always was physically weak. He would become exhausted by three hours' day work. Even a little excitement made him ill and public appearances tightened his stomach in a knot.

Some physicians of his time thought that Darwin had a peptic ulcer, others believed that he was a hypochondriac.

Neither of these diagnoses was correct, says Dr S. Adler of the Hebrew University of Jerusalem. Assessing all the evidence and adding up all the symptoms, Dr Adler has concluded that Darwin suffe-

from an infection of protozoa picked up at the age of 25 during his trip to South America aboard the *Beagle*.

Darwin himself wrote that he had been bitten by the great black bug of the Pampas and in his *Journal of the Voyage of H M S Beagle* described in detail the insect that had bitten him. Dr. Adler identified the bug as *Triatoma infestans*. Seventy percent of these bugs carry the protozoa called *Trypanosome cruzi*.

An infection caused by the bug results in a swelling of the eyes, high fever and cardiac and nervous symptoms. Technically this is known as the Chagas disease. It can persist for years and produce severe and variable physical symptoms.

Doctor Adler believes that all of Darwin's ills can be laid at the door of this disease. With good health, somato-historians speculate, Darwin's achievements great as they were, might have been even greater.

Investigators using all of modern medicine's varied disciplines may yet restore at least partially the good character of many historical villains. Take the Emperor Caligula, for example.

Today's physicians have noted that the greatest criminal in history had as a young man been as pleasant and friendly and uncriminal as the very nicest of Roman emperors. All of his criminal activities started after his wife had given him a love potion, probably *cantharides*. An overdose of this poison toxicologists point out could produce a toxic insanity that might account for Caligula's wicked behavior.

Modern medicine too has thrown new light on the actions of Henry VIII. Medical contemporaries of Henry saw no connection between his excessive behavior and his physical condition. Somato-historians, however, conjecture that all of Henry's story may add up to a single diagnosis—a syphilitic infection or infections of which he was unaware.

Henry's many wives and some of his impatience with them may be explained by his frantic attempt to do his duty by giving England a healthy male heir to the throne. But his wives tended to contract his disease and as a result in most cases suffered from chronic spontaneous abortions. In two cases at least doctors suspect the children contracted syphilis congenitally. Elizabeth and Edward VI escaped unscathed.

Today's physicians point to little noted aspects of Henry's relationship with Catherine of Aragon for diagnostic confirmation. Her first pregnancy ended with a stillborn daughter. A second child died within 52 days. A third was stillborn. Mary Tudor, of course, grew up. But her portraits show her to have been, say doctors who have studied them carefully, a congenital syphilitic.

### Nelson Always Served

Sickness may stop great men or slow them down in mid-career and thus change history. But it can also make great men, according to psycho-historians. As an example, they point to Lord Nelson.

Nelson's ills were as legenda-

his achievements. As a boy he was sickly and frail. When he went to sea at 12 it was over the protests of a nautical uncle who wrote to the boy's father, 'What has Horatio done who is so weak, that he above all the rest, should be sent to rough it out at sea?'

The sea never agreed with Nelson. Not only was he always seasick but he contracted hosts of ailments on his voyages. He had constant dyspepsia, he contracted a chronic ulcer, he caught malaria at the first whiff of the tropics when he was 16 and it lasted for years. He had peripheral neuritis of the left arm and leg, and he gradually acquired a fantastic assortment of battle wounds and lost an eye and an arm in service.

Nelson was in moderate good health on land only, but he stayed there just long enough to get sufficiently well to go to sea again. One prominent psychiatrist recently summed up his medical story in these words:

"Nelson's greatness was undoubtedly shaped by his wretched ill health. His lifelong struggle against a variety of physical misfortunes put the steel deep into his soul, gave him the psychological conditioning necessary to military greatness. If somebody had cured him early of all of his complaints he might have been second rate."

It has often been stated that there is a relationship between genius and disease. The literary world has always been particularly fond of this idea. In our era the theory has been

put forward by the critic Edmund Wilson in his book, *The Wound and the Bow*.

Weighing the medical merits of this belief, Havelock Ellis made a study of 1,034 geniuses in British history. He found that more than 100 suffered serious ill health during their active lives and that 57 of these individuals had severe emotional disturbances.

On the other side of the argument modern medical authorities point out that this rate of physical and emotional illness among the great is no larger than among the obscure. 'But even if it were larger,' states one, "it would not mean that sickness caused the greatness, but only that the great got sicker more often than the ungreat."

### Roster of Tuberculous

According to the most recent speculations, however, one disease may prove the exception. It is tuberculosis.

The roster of the tuberculous great reads like a *Who's Who* through the ages. The names—Cicero, Chopin, Cecil Rhodes, Elizabeth Barrett Browning, Keats, J. A. Symonds and Robert Louis Stevenson represent the meager sampling of sufferers who achieved fame, and some of them might have done so because they had lung trouble.

Of all man's mortal diseases tuberculosis is perhaps the only one that ever became fashionable to have. In the 19th century so many famous writers contracted the disease that

It was identified with literary genius. The phthisic countenance and manner became so desirable that even robust Alexander Dumas made serious attempts to appear frail and consumptive.

Lord Byron, gazing at himself in the mirror, said to another poet in 1820: "I look pale. I should like to die of consumption." And Dumas was reporting quite faithfully when he wrote in his memoirs: "Every body was consumptive; poets especially; it was good form to spit blood after each emotion that was at all sensational, and to die before reaching the age of 30."

Nineteenth century medicine ridiculed the idea that there was any connection between the disease and genius, and even modern medicine does not claim that tuberculosis is

agent to genius. It can, certain doctors say, trigger the creativity of a latent genius, or cause a genius to bloom more brightly.

Evidence from history, they state, bears out this contention. Ancient Greek doctors noted the feverish urge for accomplishment and the terrible terminal optimism of tuberculous patients and called these reactions "phthisic ecstasy."

The testimony of the artists themselves has been weighed carefully by the somato-historians. The American poet Sidney Lanier had written: "I am shortly to die. All day my soul has been cutting swiftly into the great spaces of the subtle, un-

speakable deep, driven by wind after wind of heavenly melody." Lanier's exaltation increased and on his deathbed he wrote a great poem called *Sunrise*.

John Addington Symonds spoke of his tuberculosis as "a wonderful Indian summer of experience" and felt life richer, his intellectual perceptions sharper and his literary style more masterly as the result.

Coming right up to date, a prominent tuberculosis specialist of today notes that "T.B. patients, particularly young talented individuals, display enormous intellectual creativity." Despite the fact that it hurts their physical condition, they keep on working and produce their best works.

### Medical Theories

Two medical theories are advanced to explain why tuberculosis may produce genius.

The first is that though the sufferer from the disease often runs a fever, there may be no gross toxemia present. In other words, the subject is feverish but otherwise feels fine. Chronic low grade fevers, according to some medical authorities, can sharpen perception and speed up intellectual processes.

The second theory is that the disease creates anoxia (lack of oxygen) in the prefrontal lobes of the brain. This causes a suspension of critical faculties and the now unhampered "creative unconscious" of the brain can pour forth its stream of meditated art without inhibi-

Medicine cannot of



the full light of modern science to bear on patients of yesteryear. As passionately as today's doctor might like to use diagnostic instruments, they must content themselves with far less—usually accounts by contemporary experts or even lay observers. A modern diagnosis of a historical patient generally must be speculative—and sometimes the more stimulating for that.

One ophthalmologist, for example, would not accept as fact that a man as brilliant as Xerxes could have committed his entire fleet against the Greeks at Salamis for the reason historians usually give—that is, that he was duped by Themistocles.

After all, this specialist reasoned, Xerxes had a perfect view of the situation from his seat on the rocky cliff that looked over sea-borne Salamis. A school boy could see that the Straits of Salamis were too small for his huge fleet to maneuver in.

But that was just the point—Xerxes, the ophthalmologist argues, could not see what a schoolboy could for he had seriously impaired vision, and the most decisive naval battle in history may have been lost for that reason rather than any other. What more proper spectacles might have saved the day for the trouble must have been myopia

or astigmatism, according to the ophthalmologist.

The aim of the somatologist is to come up with a different diagnosis, more in keeping with symptoms of his historical patient than his ancient colleagues. The exacting work even if no longer dangerous to the patient for not only must the symptoms be examined but the source reporting the symptoms must be scrupulously weighed. As one doctor put it recently, 'Historical diagnoses develop a physician's humility.'

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Much that is important to his takes place offstage. And every corner of the past must at once decide on the true motives behind the shapers of great events. The historian of the future will do well before making any final decision on the whys and wherefores of a famous person's actions to arm himself with his subject's medical data and consult a doctor. A rediagnosis in the light of today's medical knowledge may put such a personage in his effect on his times in an entirely new perspective.



Every healthy infant is given about 15 drops of vaccine by mouth on the day of birth or on the next day. After a few months tests will determine whether or not the vaccine has provoked the production of antibodies in the infant.

RP—chemical free photography—may someday police the earth from satellites

## Photos that Melt and Freeze

by Will Jonathan

Condensed from Saturday Review

A PICTURE FILM that melts and freezes and melts again like inestructible snow and can shoot continuous movies of the earth from artificial moons adrift in the sky

Because these pictures are detailed photographs—they can even be taken in full color—and because they run in swiftly timed sequence they ultimately will enable constant surveillance of the face of the globe anything that moves at any point

the copies are made below the originals above can be melted away to make room for new photographs

There is an almost magical sound to all this but neighbors of Bill Glenn along Indian Kill Creek in Glenville N Y will hardly be surprised. A person who dares to design a house to make the living room comfortable for musical notes—and still

ends up with a very nice house—is bound not to stop there

Bill did build the living room for the music. He put the speaker of his phonograph in one corner, bounded the corner on one side with a 28 foot window of sheet glass and built a large stone fireplace on the other side

These hard surfaces threw the tone wholeheartedly across the room and into bookshelves and open spaces deliberately phased to allow the sound to die away gracefully

Aside from being slanted to fit the roof the ceiling was cushioned to drink in what otherwise would be echo and clash. The overall effect is one of intimate understanding between the house and the family in side it

There is a workshop in the Glenn cellar where Bill tinkers in the evenings. Here Bill tries to pass on to his two sons Douglas (seven years old) and Ross (five years) whatever they will take of the scientific method he acquired from his father in Birmingham Alabama

Papa Glenn was a physicist at heart and his dark haired boy (christened William Ellis at his birth in Georgia's capital 34 years ago) inherited the tendency

Bill developed his invention in the General Electric Co. laboratory within easy motor drive of the Glenn home. But unlike many GE innovations Bill's revolutionary photo film is not a product of scientific teamwork. Bill is a lab loner and his film is the offspring of one extremely ingenious man

the full light of modern science to bear on patients of yesteryear. As passionately as today's doctor might like to use diagnostic instruments, they must content themselves with far less—usually accounts by contemporaries or even lay observers. A modern diagnosis of a historical patient generally must be speculative—and sometimes the more stimulating for that.

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or astigmatism, according to the ophthalmologist.

The aim of the somatologist is to come up with a different diagnosis more in keeping with symptoms of his historical patient than his ancient colleagues. This is an exacting work even if no longer dangerous to the patient, for not must the symptoms be examined but the source reporting the symptoms must be scrupulously weighed. As one doctor put it recently, "Historical diagnoses develop a physician's humility."

• • •

Much that is important to history takes place offstage. And every corner of the past must at once decide on the true motives behind the shapers of great events. The historian of the future will do well before making any final decision the whys and wherefores of a famous person's actions to arm himself with his subject's medical chart and consult a doctor. A rediagnosis in the light of today's medical knowledge may put such a personage in a new perspective.



MORE than 400 newborn babies at Bellevue Hospital, New York City, are being vaccinated against polio. The vaccine is given by mouth on the day of birth or on the next day. A few months' tests will determine whether or not the vaccine has provoked the production of antibodies in the infant.

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P—chemical free photography—may someday police earth from satellites

## Photos that melt and Freeze

by Will Jonathan

Condensed from *Saturday Review*

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PICTURE FILM that melts and freezes and melts again like in destructible snow and can shoot continuous movies of the earth from artificial moons adrift in the sky

Because these pictures are developed photographs—they can even be taken in full color—and because they run in swiftly timed sequence, they ultimately will enable constant surveillance of the face of the globe anything that moves at any point between one picture frame and the next will betray itself

The images can be viewed on a projection screen as swiftly as they are radioed to the ground. As fast as the copies are made below, the originals above can be melted away to make room for new photographs

There is an almost magical sound to all this, but neighbors of Bill Glenn along Indian Kill Creek, in Glenville, N. Y., will hardly be surprised. A few years ago, when he

ends up with a very nice house—is bound not to stop there

Bill did build the living room for the music. He put the speaker of his phonograph in one corner, bounded the corner on one side with a 28 foot window of sheet glass, and built a large stone fireplace on the other side

These hard surfaces threw the tone wholeheartedly across the room and into bookshelves and open spaces deliberately phased to allow the sound to die away gracefully

Aside from being slanted to fit the roof the ceiling was cushioned to drink in what otherwise would be echo and clash. The overall effect is one of intimate understanding between the house and the family in side it

There is a workshop in the Glenn cellar where Bill tinkers in the evenings. Here Bill tries to pass on to his two sons Douglas (seven years old) and Ross (five years) whatever they will take of the scientific method he acquired from his father in Birmingham, Alabama

Papa Glenn was a physicist at heart and his dark haired boy (christened William Ellis at his birth in Georgia's capital 34 years ago) inherited the tendency

Bill developed his invention in the General Electric Co. laboratory within easy motor drive of the Glenn home. But unlike many GE innovations, Bill's revolutionary photo film is not a product of scientific teamwork. Bill is a lab lone wolf and his film is the offspring of one extremely ingenious mind

Although the idea of pictures that melt and freeze may seem near the forbidden rim of the esoteric, the thought behind it actually is—like most great advances in science—a simple succession of clearly expressible relationships

**T**HE BEGINNING was young Bill's instrumentation. Since the spectrograph operates by splitting up color and studying the fragments, his attention was logically attracted by a Swiss device for making TV color pictures by projecting an identical image in the three primary colors in rapid succession.

In this system known as eidophor, the pictures are reproduced on the TV screen by rippling a film of oil with a beam of electrons and shooting light through the iridescent ripple during the instant of its existence.

Bill Glenn didn't do much more than register the principle because American television had tried and already abandoned the successive projection of primary colors in favor of simultaneous projection of all colors.

He turned his mind from sight to sound and played with ways of improving phonograph records which are traditionally formed in two steps—a master etching on steel and pressing of plastic copies from that master mold.

Wasn't there a simpler method of making those duplicates? Suddenly his thinking jumped out of the grooves where sound was stored back to the momentary ripple in the

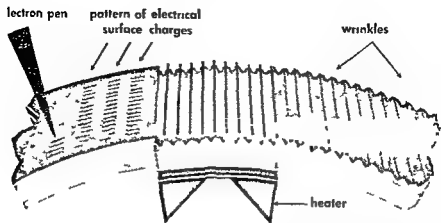
film of oil that gave off visual images.

Why not etch sound recording with an electron pencil? Come! that, why not use such a pencil to fill records with pictures? Or, better still, how about putting the picture on a film that could be reeled off for movies?

There was the invention, as sprang into Bill Glenn's head. The only remaining question was: What sort of film? High speed computers, some of them manufactured by General Electric, were already doing their memorizing and calculating on plastic tape processed to receive and retain electrical charges magnetically. The charge merely rode along invisibly on its surface. Could they possibly be persuaded to indent the tape like a groove in a phonograph record? They could be, and young Bill finally worked out a thermoplastic system of recording visual pictures in the following manner.

First the original photograph taken electronically as by a television camera. The picture is then copied line by line either in black and white or in full color by a pen that writes with electrons rather than with ink. The intensity of the lighted or shaded areas of the picture determines the force with which the pen projects the electrons in different parts of the several lines.

The point of the electron pen hangs suspended within a vacuum above a revolving reel of plastic ribbon. The ribbon is made in three layers: the top layer magnetized to receive the electronic impression



om the pen a middle layer capable of conducting electricity and a third layer to serve as a stable base for the upper two

At the moment the electrons fall onto the magnetically ready top layer the surface of that layer is solid. But immediately after that point in the ribbon has moved past the pen the layer is melted electrically and the negative charges of the electrons sink into the conducting layer in response to the attraction of positive electrical charges in the bottom of the ribbon.

Wrinkles are thus formed in varying depths depending on the force with which the electrons poured out of the pen. The ribbon proceeds in this melted state only far enough to allow the wrinkles to reach their full depth. Then the melting stops and freezing sets in instead fixing the wrinkles like long narrow panes in a furrowed window.

When rays of light are cast through these furrows the original picture is reproduced in detailed

fidelity without the necessity of passing through any of the intricate, time consuming chemistry required to develop conventional photographs.

**I**F COLOR IMAGES are desired the original picture is broken up by what amounts to an electronic prism. The light is scattered by means of a grating in which each of the openings is just wide enough to accommodate one color at a time.

The amount of ribbon surface used to record color impressions is four times as great as that needed for black and white pictures. But since the black and white version of this new form of communication holds 100 times as much information as the next most efficient means the thermoplastic recording potential for color photography is good.

Bill Glenn described his scientific working of his invention — everything seems to require a name these days, it is called in the *Journal of Applied*

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The philosopher should be a man willing to listen to every suggestion, but determined to judge for himself. He should not be biased by appearances, have no favorite hypothesis, be of no school, and in doctrine have no master. He should not be a respecter of persons, but of things. Truth should be his primary object. If to these qualities he added industry, he may indeed go and hope to walk within the veil of the temple of Nature — *Michael Faraday*

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Other researchers who knew of his work interpreted it for newspaper men. These interpretations centered mainly on the value of thermoplastic recording to Hollywood and television movie making.

It was pointed out that the possibility of viewing pictures through a magnifying lens while they were rolling onto the reel of recording ribbon would enable a movie director to edit a film as the actors performed it, making choices from different camera angles and erasing undesirable shots.

General Electric declined any comment on the new invention prior to a demonstration in New York City. Movie and TV potentialities were then made to share attention with two other perhaps more significant uses for TPR.

The automatic factory and the automatic office are nearer because of Glenn's ingenuity. TPR's images can be conveyed electronically without diminution in the amount of

data that is packed on microfilm. One standard size typewriter ribbon spool would hold every word of every page of the 24 volumes of the current edition of the *Encyclopaedia Britannica*.

If there were a person who could flip the pages fast enough the pictorial image of the text of each of the 24 books could be recorded in one minute of time. And if the human eye were able to read at sub-breakneck speed, the words could be scanned while they flew from the printed pages into storage on the rolling reel.

Even more important, for some purposes is the possibility of stopping the ribbon instantaneous projecting information recorded at a particular point in quickly readable form, making a decision based on the data and then proceeding.

• • •

It is to the earth satellites that the greatest benefit of TPR accrues. A satellite is only as valuable as the information it sends back to earth. Because of size and weight limitations telemetered results of satellite observations are notoriously limited. Now the spectrum is immeasurably broadened.

A global police system has thus become practical through young Glenn's invention. When it finally takes form no one will be happier than he. By choice a lonely inventor in the laboratory, he is a warm and friendly extrovert in every other way. If posterity tags him for fame as a force for peace among men, it will be because of an accidental

nction of his science and a particular moment in history

But on a smaller scale young Bill has been more deliberate in his efforts to protect the human species from foolishness. The contribution his neighbors know best is the catamaran hull he poured from plastic foam and covered with glass cloth. His boat can't possibly sink when runs it before the wind.

The boat even has a transparent sail so Bill can always see what he is heading into. When the sun's rays slant at a certain angle the effect is one of voyagers in a dream apparently unpropelled yet unmistakably moving.

There is an ephemeral quality in the air then reminiscent of Bill's pictures which melt and freeze and melt again.

## Tiny Animals Build Earth's Crust

MILLIONS OF TRILLIONS OF TRILLIONS of invisibly small animals are major builders of parts of the planet's crust. In the past several hundred million years they have made limestone floors much as 100 feet thick. They have been contributors to the rocks of some lands—about 30 percent for example. On the West Indian island of Barbados there are countless numbers of them almost everywhere in the present oceans and almost 1/3 of the floors in the deep parts of the oceans are composed largely of the remains of these animals. Most of them however are so small to be seen without the aid of microscope.

Probably the largest collection of these creatures in the world is in the Smithsonian Institution where these tiny creatures are being classified and studied.

These animals are the Foraminifera most of which are about the size of fine grains of sand. They constitute a major animal order. Each is a single cell living in a single or several chambers of a hard decay resistant

by a cement produced by the animal.

These tiny creatures live in prolific numbers in the surface waters and on the bottoms of the present oceans. They are also abundant in rock deposits formed under the sea millions of years ago. Because of their great abundance and their limy shell which is preserved in mud after the death of the animal the Foraminifera are important aids in interpreting conditions in the geologic past.

Of particular interest are those Foraminifera which live in the surface layers of the oceans the so called pelagic forms. When they die they sink to the bottom of the sea floor where the shells are preserved in the mud. In the deep ocean areas far removed from land the amount of shells is actually greater than the amount of mud on the sea floor and these form deposits known as globigerina ooze.

This process has been going on according to recent findings since the Cretaceous geological period when the lands were inhabited mainly by dinosaurs.

Because lime is soluble in very hard waters Foraminifera are not found in the very deepest parts of the basins.





## WHAT'S ON YOUR MIND ?

### CHILDREN MAY SUFFER FROM "SCHOOL PHOBIA"

Children who develop an intense aversion to going to school may be suffering from "school phobia."

This is a psychiatric condition which apparently has been growing steadily in the last decade according to an article in *What's New*, Abbott Laboratories publication for the medical profession.

"It cannot be stated with certainty whether the increase reflects greater incidence or a more widespread recognition of the psychiatric aspects of the disorder," the article states. At the same time it can be assumed there are a large number of unreported cases."

Most frequently found in children between the ages of six and ten, school phobia is defined as a "partial or total inability to go to school that results from an irrational dread of some aspect of the school situation." The remedy is, "assurance and matter-of-fact recognition that school attendance is mandatory."

This may be difficult because of the "neurotic involvement" of parents. "The typically overprotective mother clutches at the child's complaints as adequate excuses for letting him stay at home. The father is frequently a passive individual who will join forces with the mother to help project the blame for the child's behavior onto the school."

One aspect of school phobia is that the child, even though he remains home during the school hours, is very much concerned lest anyone know he is not at school. Most observers believe the condition is usually related to "an intense fear of leaving the security of home and mother."



If the situation is allowed to worsen, the article suggests that a therapeutic program may have to be worked out involving teacher and parent cooperation and psychiatric aid.

### "TRUTH DRUGS" CAN PRODUCE UNTRUTHFUL STATEMENTS

A Yale psychiatrist warns that drugs called "truth drugs" quite often produce untruthful statements from the patient and are therefore not reliable for criminal interrogation.

Doctor Lawrence Z. Freedman of the Yale School of Medicine emphasizes that these drugs, such as sodium

amytal and sodium pentothal, extremely useful in psychiatric treatment, but that the "truth" fact has been misinterpreted by the public.

Hypnosis, the technique of employing drugs to stimulate the patient's talk will usually stimulate a noncommunicative patient to uninhibitedly and thus speed treatment. But is the talk always truth?

No, answers Dr. Freedman in a report published in *Scientific American*: "I have employed sodium amytal in investigating the personalities of men accused of various civilian and military antisocial acts states. The subjects ranged diagnostically from those with character disorders and neuroses to psychotics. The offenses charged to them included mild delinquency as well as murder.

Out of all the information I obtained from them during hours of interrogation under the influence of the drug, there was little that could be interpreted directly in the light of its manifest content. I could, on the basis of a patient's statements, testify in a court that I knew at a given act had occurred. Guilty subjects under sedation were prone to confess to offenses they had

the embryonic science of criminology and to the administration of justice if this procedure is employed as a fact finding instrument."

#### EXECUTIVES WANT SYMBOLS OF STATUS

Corporations which give Cadillacs, keys to the washroom and other status symbols to their executives are following sound business strategy according to George S. Odiorne, director of the University of Michigan Bureau of Industrial Relations.

While businessmen may enjoy status based on power over others, the U.S. has at least two other social hierarchies, he explains. One is based on intellect, the other on taste.

America can't be described simply as a rigid series of sociological strata, says Odiorne. "Janitors and charladies may play in community symphony orchestras. Machine operators and secretaries may have finer tastes, more discrimination in the arts and read more cultural books than the president of their corporation."



negative sign indicated they had committed."

Doctor Freedman stresses that serious wrong can be done both to

'Highbrows in our society from the standpoint of taste, aren't the highest paid. Middlebrows may live in mansions or cold water flats. Some of the purest specimens of taste and ordinary intellect seminars open only to executives

America is still a democratic, equable and brawling country. Permanent elites which combine state, intellect and taste as did the landed aristocracy of old Europe are getting farther and farther away.

Odiorne suggests that corporations can use status as an incentive for potential executives. He also pointed out that a person pays a price for moving into the higher status management groups.

A top manager must sacrifice his leisure time and give up most of his cultural and esthetic pursuits. He must not expect a normal family life and will be forced to give up the stability that comes with living in one place. Odiorne concludes:

#### BRITISH DOCTOR WARNS WIVES MAY BE KILLING THEIR HUSBANDS

The number of women who deliberately set out to kill their husbands is surprisingly small, says Dr. Kenneth C. Hutchin of England.



On the other hand a great many wives could not polish them off better if they tried," he added.

He cautioned that the wife who always insists on having the last word often has it.

Doctor Hutchin's remarks were quoted in *The New York Times*.

When your husband comes home from work, tired out after a hard

day, be bright and cheerful. Don't start telling him your troubles before he is properly in the house," Dr. Hutchin suggested. "The wife let him have a cup of coffee before you start in on him."

Anger and frustration are dangerous emotions for tired middle-aged men with a poor coronary circulation, Dr. Hutchin said, and he advised that wives humor their husbands a little.

It is risky for a woman to cross her husband continually, Dr. Hutchin warned. He may be wrong, he is probably not, but why do you have to hurt him?

The trouble is that men like to think they know best, Dr. Hutchin said. Why not let them think so? It is not a very high price to pay for peace and security and good health.

If you can make your home a haven from the busy world, your family will be grateful to you. After all that is what a home is.

#### TABOOS STILL EXERT STRONG INFLUENCE

The supernatural still exerts strong influence in some parts of the world.

Strange taboos delay the acceptance of new medical knowledge and agricultural methods.

South Sea Islanders first used the word taboo to denote certain forbidden things, words or acts. The National Geographic Society says. In common usage the term meaning has since been extended to include almost anything frowned upon, even the mere indelicacy in pe-

cles of eating peas with one's fingers

In the strict sense, however, a taboo must carry an occult danger. Making a taboo means the culprit will inevitably be stricken by supernatural retribution.

Taboos persist in civilization. Any people consider it bad luck to walk under a ladder, open an umbrella inside the house or put a hat on the bed. The idea is that something uncanny will happen to anyone committing such an act.

Did the power to impose taboos—did it sometimes die?

In the valley of Puamau, reported anthropologist Ralph Linton once visited the local chief, who had a boy of eight or nine. When I arrived the chief and his family were camping in the front yard, and the boy was sitting in the house looking both glum and triumphant. He had had a quarrel with his father the day or two before and had tabooed the house. Until he lifted the taboo, no one in the family could enter the house.

#### PSYCHOANALYSIS NOT DEDUCTIBLE OR PSYCHIATRIST

A psychiatrist who tries to improve himself psychiatrically by having himself psychoanalyzed can't deduct the cost of the analysis from his taxes as a business expense, says the United States tax court.

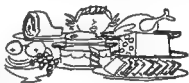
The court decided that a psychiatrist is actually training himself in a new field while undergoing psy-

choanalysis rather than improving himself in psychiatry.

According to the court, a psychiatrist is a medical doctor who has been trained in psychiatry in order to help patients with their mental problems. A psychoanalyst is a psychiatrist who having been psychoanalyzed himself is qualified to administer to his patients a long term therapy called psychoanalysis.

#### MENTAL ATTITUDE AFFECTS TENDENCY TO OVEREAT

Emotional depression disturbs the normal balance of sugar metabolism in the body and this in turn causes some people to overeat, investigators have found.



The overeating is not caused by an increase in the hunger drive, but by a failure of the brain's signal mechanism to indicate when hunger has been satisfied. Dr. Albert Stunkard, professor of psychiatry at the University of Pennsylvania, reported. The upset sugar metabolism seems to interfere with proper stimulation of the brain's mechanism for indicating hunger satisfaction.

Research by Dr. Stunkard and 15 other investigators indicates that mental attitude and reactions play an important role in accelerating a person's incline to become overweight.



## LEARN how to LISTEN

by Eileen L. Daly

Condensed from *This Week Magazine*

THE ATMOSPHERE in the conference room was tense. Five young engineers were sitting with the head of a large industrial planning organization, trying to settle details of an important new plant site for a major client.

Suddenly one of the young engineers proposed what he considered a sensible solution to the problem. What he had to say was greeted by an uncomfortable silence. The head of the concern then laughingly pointed out that the same proposal had been made and rejected some minutes earlier.

The incident seemed amusing at the time, but several months later didn't. After the project had successfully completed, most of the engineers who had worked on it were promoted, but the young engineer who had made a fool of himself at the conference was passed over.

What had happened? The young engineer swore that he had heard the proposal made and rejected—and he was right. He was a victim of a bad listening habit. He didn't even realize he had.

But listening habits can handicap you mightily in your daily life. Much of your success, both in work and socially, is related to it.

to listen. A number of major industries and more than 20 leading colleges have become so concerned about our faulty listening habits that they have set up listening clinics and courses to find out what's wrong—and what to do about it. My own experience as a teacher in one of these clinics has convinced me that many people who seem to be listening miss important points and draw incorrect conclusions from what is said. And that is a serious handicap when you consider that our attitudes toward so many things—what to think of other people, how to make good on the job—are shaped more by the persuasive spoken word than by any other means of communication.

What are the faulty hearing habits that threaten us in so many ways? Here are some of the more common ones I've observed in a close study of my many clinic students.

Our minds won't wait. Our thoughts can race along from four to ten times faster than most people speak. So while we are waiting for the words to come in our thoughts tend to go off on a tangent and sometimes remain away too long.

Your boss perhaps is discussing a situation with you. You want to hear it all. But what happens? Your mind tunes out, comes back, tunes out again. Why doesn't someone kill that fly? I wonder who just came into the other room?

Suddenly a few words penetrate. Since you agree with my suggestion, your boss says. What did he suggest? Such tuning out lapses

are common—and sometimes costly. We think we know already.

We're so sure we know what the speaker is going to say that we listen with just half an ear.

A newspaper publisher once told me how this listening habit had cost him a sizable sum.

WHEN A REGULAR CLIENT telephoned an order for a new series of ads, the person taking the order simply wrote out a standard order form. Not until too late did the publisher learn that the client had wanted the new ads to be four times as large as the old. But since the smaller ads had already been set in type by then, the client decided to run them.

One clerk's job around that newspaper office was pretty shaky for a time.

We're looking not listening. How often in introductions has a name failed to penetrate because your mind was occupied with its owner's appearance or mannerisms? For the same reason, and far more often than you may suspect, other information fails to register.

We are busy listeners. We try to listen while giving part of our attention to a newspaper or a radio or television program. Outside noise also clamors for a share of our attention. No wonder we don't really hear.

We miss the big idea. Once I gave my students a list of vocabulary words which would appear in a recording of a newscast. The students were to listen for these words

consider how they were used in context

But when I questioned them about the general content, they replied, "Oh, we weren't listening for that; we were just listening for the words"

The poor listener "just hears words" Have you ever had the feeling that a speaker said a lot but that you didn't quite "get" it all? This may have been the speaker's fault, or perhaps you haven't learned to look for the main ideas and the important supporting details

Our emotions make us deaf Do you recall a speech or conversation that got you riled up? How well did you listen once your blood started to boil?

When someone offers opposing ideas on a matter about which we have a strong opinion—religion, say, or politics—we unconsciously feel that it is risky to listen we might hear something that could make us question our own views We mentally stop receiving him while we plan our verbal counterattack

These are some of the common listening faults Fortunately with so little effort you can correct any that may be handicapping you I recommend these six ways to make yourself a better listener

1 Learn to concentrate It's an important factor in listening Practice such games as "Take 2 plus 3, minus 5, plus 4, times 2 minus 6—what's the answer?" Similar exercises are used in listening training courses

2 Run a television test With a friend or relative listen to a radio

or television talk See how many of the ideas presented you can recall

If you find yourself "Well, he sort of talked about and then he said and then you may have missed the point With the other listener, try to agree on a pretty specific list of the main ideas



3 Cut out distractions Remember to put aside the newspaper and half listening to a radio or television program when someone is trying to talk to you

4 Accept controversy When someone brings up a controversial subject don't automatically become deaf Check your all too natural tendency to stop listening by thinking up devastating remarks to deliver in the next silence

Instead plan a question based on his remarks Not the kind that cuts the opposition down to size, one that will make sure you are getting what is being said

5 Repeat instructions Practice repeating instructions and directions correctly Unless you can do so obviously you will not be able to get them out properly

6 Help others listen I encourage bad listening habits in our children by repeating our commands several times before getting obedience Insofar as possible should give them a command once and after that impose some penalty so they will listen the first time

and we might set them a good example by listening to them the same time

Good listening isn't easy. Effective listening—hearing, understanding and remembering—takes a great deal of energy. It is difficult to listen properly and do anything else at the same time. But it pays.

By recognizing and correcting any listening faults that may be hindering you, you may discover that it is possible to listen your way to closer friendships, better relations with your family, larger pay checks and general success in life.

## Quiz

*Don't read this—have some one read the following quiz to you while you look at it yourself. Use pencil and paper and answer as best you can. Here goes.*

1. In the list of names—George, David, Adam, Kenneth— which begins with J?

## Foam Points to Contaminated Well Water

SOAPY FOAM in your drinking water may mean the well that supplies the water should be abandoned as unsafe. Detergents, unlike soaps, are only removed by a septic tank. Joe Deluty of the Rhode Island Department of Health explains in *Public Reports*. They are very stable and will travel long distances through the ground and into the water supply.

As more housing developments go up where public water supplies or public

2. Suppose you were given these directions: 'Go to Room 325 and look in the lower right hand drawer and bring me all the boxes of writing paper that are left in there.' Were you told to look in the left or the right hand drawer? Were you told to go to Room 235, 325 or 225?

3. Answer true or false to the following. In the list of words below—see—free—glee—me—the second word mentioned is the word free.

4. Mary asked her husband to bring home meat, milk, cheese and bread. He brought milk, peas, bread and meat. Which item did he omit?

Here are the correct answers: 1—John, 2—right and 325, 3—false, 4—cheese.

How did you come out? If not too well, you have a great deal of company, however, by following the six recommended steps you can improve your listening habits.

sewers are not available, contamination of drinking water with detergents can be expected to increase. Deluty says:

If detergent concentration is high enough, that is sufficient evidence that seepage from the sewage disposal field is getting into the well.

Deluty's department recommends lot sizes of at least two acres where there are no public water facilities and a distance of at least 100 feet between any well and any sewage disposal unit.



# Satellites Now In Orbit

The United States recently launched two important space vehicles. The second of the two was the 270 pound weather eye satellite, Tiros I which was launched April 1. Tiros I is the first artificial satellite to provide detailed photographs of the earth's cloud cover. Tiros I is considered a prototype of satellites that are expected, in a few years, to give worldwide weather data to forecasters.

Before Tiros the U.S. shot a 94.8 pound sphere, Pioneer V, into unending orbit around the sun. It marked the first time a "live" message had been sent so deep into the solar system. Two other cosmic vehicles, Soviet's 3,245 pound cosmic rocket (Mekhta) and the U.S.'s 13.4 pound Pioneer IV, fell into orbit around the sun after their radios had gone dead. At that time they were about 400,000 miles distant and from then on of no longer of value to science.

Pioneer V, which was launched last March 11, was expected to continue sending back valuable information until about mid summer. At that time it will be more than 50 million miles away from the earth, and its 150 radio transmitter will be out of range. If the planetoid's instruments are out of radio contact may be re-established in 1963 when Pioneer V comes within 50 million miles of the earth.

Following is a list of satellites launched from the earth and still in space as of April 10, 1960.

Name	Country	Weight	Date Launched	Est. Lifetime
Explorer I	U.S.	30.8 lbs	1/31/58	3-5 years
Vanguard I	U.S.	3.25 lbs	3/17/58	200-1,000 years
Lunik I* (Mekhta)	U.S.S.R.	3,245 lbs	1/2/59	long life
Vanguard II	U.S.	20.7 lbs	2/17/59	10 years
Pioneer IV*	U.S.	13.40 lbs	3/3/59	long life
Explorer VI (Paddle-Wheel)	U.S.	142 lbs	8/7/59	to Aug 1960
Discoverer V (rocket parts only)	U.S.	less than 300 lbs	8/13/59	burned up 9/28/59
Vanguard III	U.S.	about 100 lbs	9/18/59	30-40 years
Lunik III	U.S.S.R.	about 614 lbs	10/4/59	long life
Explorer VII	U.S.	91.5 lbs	10/13/59	20 years
Discoverer VIII	U.S.	(not available)	11/20/59	2-3 months
Pioneer V*	U.S.	94.8 lbs	3/11/60	long life
Tiros I	U.S.	270 lbs	4/1/60	(not available)

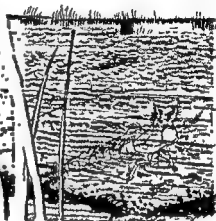
\* in orbit around sun



One moment they are crawling things,  
the next they take to the air on wings

## Strange Drama of the May Fly

by Roy L. Abbott



OF ALL the world's creatures, May flies come nearest being flylike and unreal. Four-winged and with long streaming tails—fragile and light as air—they come into adult life at the beginning of summer, dance themselves to death in the twilight of a single day and die, usually without seeing a sunrise. Strange creatures, these May flies! Seemingly born of the mud and slime of lake or river bottom, at one moment they are sluggish crawling things, the next they take to the air on broad shining wings.

Up there in the shadows above the water, instinct leads them each to

its mate, for this is their mating day and this their mating flight.

For a few hours they frolic and dance merrily together, then they part, the males to struggle on until death comes, the females to drop eggs into the water, only soon to flutter after them and drown.

To those who live in the higher and drier parts of our country, May flies are almost unknown, but to those who live near the Great Lakes or along the Mississippi, they are an early summer pest. The flies swarm about street lights; they get in one's face like a cloud of big gnats, and their countless bodies make it

sidewalks slippery underfoot Just recently, in a city along the Mississippi, I saw a man early one morning shoveling them from the sidewalk in front of his store

Uncounted millions fall into the water and swept along by current and wave pile in windrows along the shores other millions become food for fishes who enjoy a field day when the May flies are in the air The so called duns and drakes of the British anglers are merely artificial lures made in imitation of the delectable May fly

Men who study May flies call them *Epheméridæ* which is Greek for saying that they are short lived—children of a day Many in fact do not live a full span of 24 hours mouthless and without any reserve food supply their frail bodies are seemingly too weak to endure their new found environment

To see the drama of the May fly you must thoughtfully plan ahead for the opportunity comes but once a year People who dwell by lake and streamside have doubtless been present at the birth of these tiny creatures as I have been many times

To observe this strange happening one must watch closely For on the particular day they have chosen for birth no weather sign gives notice that they are about to be born But bend close to the water and you may see many tiny creatures full grown May fly larvae or nymphs creeping forth from the mud at the bottom

They are doing something they have never done before leaving their

haunts amid the slime and ooze places to which they have closely adhered for one or two years—and coming to the surface

They are ugly creatures—like immature May flies—with 14 legs long three-parted tails and bodies fringed with flat gills through which they obtain—somewhat like fish—oxygen from the water When a May fly reaches the surface of water a most amazing thing happens The body covering rends away on the back of each fly and then after a moment's frantic wriggle the May fly is born!

FOR NOW there issues from the cleft in the strange creature's armor not the same being you the moment before but a May fly—a winged birdlike air-breathing mouthless thing as unlike the animal from which it sprang as a lizard is unlike a lizard

Although winged this marvelous newborn insect is still not ready to live its short life in the air It must yet undergo another unusual thing—it must shed its outer covering once more an act that no other adult insect ever performs Fluttering to the nearest branch the fairy May fly quickly divests itself of its outer coat even to the last gauzy covering of the wings and now in full maturity and attire takes to the air

Yet this glorious "coming out party" of the May flies—this almost unbelievable drama of birth and death in a day—has not been without elaborate preparation A week or more before countless other M

s set forth on this same strange  
ht, and near the end of that dance  
death each female had dropped  
500 or 600 eggs into a lake or  
eam

Each egg had quickly hatched into  
ny, flattened creature wingless  
first and soft of body, but with six  
rdy legs, well formed jaws and  
appetite for plant food which  
it constantly nibbling at the  
elation at the bottom

Here, in secret places among the  
d weeds and mud it ate greedily  
d grew rapidly so rapidly in fact  
shed its body covering every  
nth or so—its wing sprouts get  
g longer with each molt—for like  
insects its outer coat would not  
etch and had to be discarded if its  
sses or were to grow

Men call this little immature May  
/ a naiad perhaps fancying that  
e those nymphs of myth it too  
esides over the water in which it  
es But the tiny naiads—never  
ger than your thumb's length—  
e not only innocent of any knowl  
ge of their name but of the qual  
es of their fabled predecessors as  
all

Because of the air tubes running  
tward into the plate like gills  
uch fringe their slender bodies the  
nds do not have to go to the sur  
ce to breathe as do mosquito wri  
ars, water bugs, and beetles which  
e near them Being almost en  
ely vegetarian in habit they do  
t need to prowl so ceaselessly for  
od as do these creatures whose  
enu calls for meat and because of  
as activity do not expose them

selves to those who would kill them

**D**ESPITE these advantages, the  
life of the naiad is a precarious  
one Millions of naiads become adult  
May flies it is true, but only because  
they are the fortunate ones among  
the many other millions who started  
life at the same time as they but fell  
victims to the countless predators  
who hunt the naiad as men hunt  
game

Nature apparently thought of the  
May fly at its creation as men did  
of the machine gun If the machine  
gun is fired often enough it is bound  
to hit someone reasoned the human  
inventor If nature produces enough  
naiads some are bound to grow into  
mature May flies So in spite of the  
enormous yearly casualty list, some  
do grow up

What are the enemies of the  
naiads? Many fish eat them Some  
in fact depend upon them almost  
entirely as a source of food Perhaps  
their most sinister enemy, is the  
dragonfly nymph, the adult of which  
is that fierce insect hawk, called  
'snake doctor' or 'devil's darning  
needle' because of its supposed  
ministrations to snakes, or its pen  
chant for "sewing up the ears" of  
bad children

But the dragonfly is really harm  
ful only to insects and its is  
that mud colored square  
harmless looking jet propelled  
mon—is the real enemy of the

Jet propelled? Yes the  
dragonfly moves by the  
of drawing water into its  
tine and shooting itself

short spurts by forcibly ejecting the water at the rear. But much of the time it lies quiet, its flat face appearing as harmless as a clod.

When the unsuspecting naiad comes within range however the dragonfly nymph suddenly unleashes its weapon. Half or more of that flat face is shot forward like a jack in the box and when it—the masked jaw—is withdrawn again into that clodlike face of the nymph the poor naiad is behind it—one of the many who never grow up to perform the airy 'dance of death'.

Anyone watching the long history of the May fly's infancy—the whole to be climaxed by only a day of adult life—can readily see in this creature a reversal of the usual order of life's cycle. With most animals—the larger ones at least—the period of infancy is usually crowned with a much longer period of adulthood. Infancy is only a preparatory growing up time for adulthood—the really purposeful part. No one knows however why the May fly has gone

about its business of living in topsy turvy fashion.

THE OBSERVER too, ■ likely to conclude that the May fly is a creature at least, which *re*proves that there is something ■ under the sun. Here surely is an animal which serves no useful purpose. But such is far from the truth. For the very observer who reaches that conclusion ■ one of those creatures most benefited by this apparently useless life. It need only be recalled that fish eat May flies—that men eat fish.

The scientist Blaise Pascal amused himself by speculating upon what might have been the ■ upon the course of human history had Cleopatra's nose been say an inch shorter than it was. That question of course is unanswerable today but it is not difficult to believe that the fishlife of our inland waters and those dependent upon the fish would be greatly changed were May flies exterminated.

## Weaverbird Attracts Mate With Nestbuilding Skill

A COLONY of African weaverbirds now living on the University of California campus is keeping scientists informed on the species' interesting nesting and social customs.

The male village weaverbird weaves an elaborate nest then attempts to lure the female by clinging to the underside of the nest and giving a noisy display. The female then inspects the nest and if she likes it the two become

mates according to Dr. Nicholas Collias, UCLA zoologist who spends his year studying weaverbirds in Africa and now maintains a colony of

Some ambitious males in Dr. Collias' colony have gone in for multiple building and during the past breeding season 11 of them built a total of 11 nests. Those able to sell more than one nest naturally became fathers.

—Scope Weekly



## Find 2,600 Year-Old Seals Frozen in Antarctic

THE U.S. COAST GUARD icebreaker *Eastwind* brought back from Antarctica the perfectly preserved carcasses of two 2,600 year old seals.

The seals were delivered to the Lubbock Technical Museum in Texas for study and research. They were among a group of 90 dead seals which an aerial survey photograph had shown entombed in the ice of Taylor Ravine in the Antarctic. Capt. Richard D.

Schmidtman, captain of the *Eastwind*, said:

Special scientific processes have shown the seals to be about 2,600 years old. Capt. Schmidtman said scientists had concluded that the seals had either wandered into the ravine or had been chased there by some unknown animal. The ravine was miles from their natural food and they had starved to death before they could get out.

## Growth Linked to Lack of Germs



SCARCITY OF germs may be helping Americans grow larger from generation to generation while stature remains constant in seriously underdeveloped nations, research at the Rockefeller Institute suggests.

A recent study shows that mice raised in semi-germ free conditions grow abnormally well on adequate diets and even continue to grow on diets that ordinarily would be called deficient, reports *The New York Times*.

The ultra-clean mice, however, proved abnormally susceptible to illness when they were subjected to disease-causing germs.

The findings on growth were most unexpected according to Dr. Rene J. Dubos, a microbiologist at the institute. He said they indicated that the germs that lived normally in the digestive tract were of surprisingly great importance to overall health and nutrition.

• • •

He also said that foreign scientists visiting the experimental mouse colony at the institute had suggested parallels between American children and germ-scarce mice on the one hand, normal mice and children in primitive conditions in underpopulated areas on the other.

## COUGH'S VELOCITY LIKE A HURRICANE

To remove life endangering foreign bodies from the lungs, nature has given man a powerful, built in air compressor

The compression chamber is the rigid walled chest. Its contracting muscles squeeze the air trapped in the lungs so that the pressure mounts to a seam bursting point

Then the muscles around the voice box relax opening the glottis. There is a sudden release of pressure in the lungs. At the same time a piston in the form of the muscular diaphragm comes driving upward against the lungs.

The air rushes out of the respiratory tract with a velocity that some times reaches the speed of a hurricane, says Dr. Andrew Banyai, Chicago physician and world expert in chest diseases.



The whirlwind sweeps up and carries with it mucus and other objectionable matter from the air passages.

Thus the cough is often a healthy cleansing device. Dr. Banyai points out in *GP*, publication of the American

for a cough medicine, he told physicians



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On the other hand, it is important to make certain the cough is serving a purpose. For a useless cough is without a certain amount of danger.

Violent coughing spells have been known to fracture one or more ribs, Dr. Banyai explained.

They also have caused fainting spells lasting from a few seconds to two or three minutes, imposed strain on the heart, set off headaches, led to undue fatigue and stress, even torn a hole in the diaphragm, the muscular lining separating the organs of the chest from the abdominal cavity.

## ANEMIA-CAUSING AGENT IMMUNIZES RATS TO CANCER

The first successful cancer immunization of animals with a blood substance is reported by the American Cancer Society. Heretofore, animals have been immunized with whole tumor cells and with extracts from tumors.

The blood substance may be a pure chemical. It is known as Filterable Hemolytic Agent. Jerome H. Sacks and Dr. Richard F. Edahl of the Medical College of Virginia, who have been working

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# DICINE



By Arthur J. Snider

With it have found it has prevented high percentage of the six types of experimental rat tumors tested so far

Whether this finding will have any application to the prevention of human cancer is highly speculative. The American Cancer Society emphasizes that vaccination success achieved so far has been only against standard transplantable tumors in rats. It is not known whether it would prevent the appearance of tumors which develop spontaneously in rats or whether it would immunize against transplantable tumors of mice or other species.

The FHA agent is a tiny molecule less than 1/50th of a micron in diameter indicating that it is either a remarkably small virus or a fraction of a virus. It is large enough however to induce a strong antibody reaction when used as a vaccine. An average of about 55 percent of rats vaccinated with it before a tumor was transplanted into them were completely and possibly permanently immune to it.

FHA causes acute hemolytic anemia a disease in which red blood cells are destroyed. This makes ex-

perimentation with it in humans a potentially dangerous thing. Many more animal tests must be conducted before human tests may be considered.

## OIL FATS BENEFICIAL IF SUBSTITUTED FOR HARD FATS

The dieter using liquid fats to lower abnormally high cholesterol is cautioned in an editorial in the *Journal of the American Medical Association* that they are substitutes not supplements for hard fats.

Doctor Herbert Pollack of New York University, author of the editorial, said many lay persons apparently have been led to believe that oil fats are in effect a medicine, and that simply adding them to the diet on top of normal food intake will lower the cholesterol.

That diet will lead only to obesity, says Dr. Pollack.



However, if substitution of oil fat is made under proper direction, the blood cholesterol level can be lowered to a greater degree than if the individual reduced his fat consumption generally.

The blood cholesterol role is one of the most sharply debated issues in medicine.

... .. number of



greases the skids for a heart attack. Among hard fats are cream cheese, butter, ice cream fatty types of meat, bacon and lard.

The oil fats such as corn oil, cottonseed oil and soya oil contain an appreciable amount of unsaturated fatty acids that will lower the blood cholesterol level, according to Pollack.

By contrast, the solid fats contain more 'saturated fatty acids' that raise the cholesterol level. A vegetable oil that has been hardened into a margarine or shortening for example, loses many of its unsaturated qualities.

#### AVERAGE FAMILY SPENDS \$294 FOR HEALTH SERVICES

The average American family is spending 42 percent more for personal health service than it did five years ago, according to the Health Information Foundation.

The two groups at either end of the age scale—children under six and persons over 65—increased their

use of medical services, 23 percent. Drugs and medications, 20 percent. Dental services, 15 percent, and other medical goods and services (eye care, special duty nursing, etc.).

Expenditures varied greatly among families. About one third of all families spent less than \$100, another third \$100-\$299, and the remainder third \$300 or more. The average family spends about \$294 a year.

#### 'HEAD-TILT' RESUSCITATION TECHNIQUE IS FOUND BEST

The mouth-to-mouth resuscitation method can be improved if the head of the victim is tilted back as far as possible, according to findings of seven research centers studying emergency artificial respiration.

Inflation of the lungs through the nose is preferred, since it prevents air from getting into the victim's stomach, the report in the *Journal of the American Medical Association* said. It also is best suited for a victim whose jaws are too tight to be opened.

The research centers said they found oral airways for resuscitation, such as tubes and masks which have been placed on the market, should not be used by untrained laymen. They said such devices have been promoted and sold without official medical approval.

The steps in the new 'head-tilt' method are these:

1. Lift the neck of the victim.
2. Tilt the head as far back as possible by holding the crown of the head with one hand. Sufficient tilt usually opens the victim's mouth.



use of medical services by about 45 percent during the five-year period.

The largest single component of spending for health in the year of the study (1957-58) was for services of physicians. It accounted for 4 cents of the health dollar. Then

3 Pull the victim's chin upward  
4 Inflate the lungs through the nose or mouth or if an infant through the nose and mouth

5 Remove your mouth to let the victim exhale passively

Small victims particularly after immersion in water or obstruction by a foreign body in the upper airway should be inverted and if necessary sharp blows applied between the shoulder blades to help dislodge the offending material

#### TELEMETER IMPLANTED IN ANIMAL TRANSMITS DATA

A temperature telemeter implanted permanently into a laboratory animal to transmit information has been developed by a bioelectronics engineer at the Franklin Institute Philadelphia

John H. Busser who developed the device for the Office of Naval Research said the telemeter needs no batteries. It works when the animal in which it is implanted is surrounded by a low frequency power field—equivalent to placing the animal inside a transformer. From this power field the device gets energy to send back its findings to a receiver.

The telemeter so far is capable of transmitting information only on temperature but it will be modified to transmit such information as blood pressure and heart beat.

It promises to give medical research men more accurate information on fever, man's natural defense against germs and viruses. It eliminates the need for handling animals in order to obtain readings.

#### EARLIER PRESIDENTS LIVED MUCH LONGER

The average age at death of the first ten presidents of the United States—Washington to Tyler—was 77.4 years. Among them were John Adams who died at 90 and three octogenarians. They were Thomas Jefferson who died at age 83 (on July 4), Madison 85 and John Quincy Adams 80. Only Washington at 67 and William Henry Harrison at 68 died before they were 70.

By contrast the last ten presidents who have died from natural causes had an average age of 64.3. President Taft was the oldest in this group living to 77. The only others to reach the 70s were Hayes and Cleveland at 70 and 71 respectively.



Doctor Louis H. Roddis, a retired captain in the U.S. Medical Corps, has studied the life span of presidents. He said that while the number in each group is too small to draw any firm conclusions, the difference of 13 years between the average age of the first and the last ten presidents is rather startling and encourages speculation.

The question arises whether the increased duties of the office are such that they shorten life or whether earlier presidents

tougher breed of man. Perhaps it was pure chance that gave us individuals in the first ten presidents who had a naturally longer life span than those in the last group.

Doctor Roddis notes in *Current Medical Digest* that the longevity of the first ten presidents is all the more striking because of medical progress during the last 100 years. Life expectancy has increased about 20 years in the last half century in this country.

Three presidents were assassinated. They were Lincoln 56, Garfield, 49, and McKinley 58. Indeed says Dr. Roddis the office of president may be considered an occupational hazard.

#### "SIT OUT" ASTHMATIC ATTACK, PHYSICIAN ADVISES

A University of Chicago physician is telling his asthma patients to throw away their pills, sprays, inhalators and other self-administered drugs and devices.

He encourages them to "sit out" their attacks, to take it easy and resist panic. The result? No more emergency type attacks.

Doctor George V. LeRoy, professor of medicine, got the idea from reading some old text books. The kind that in this day of wonder drugs and miracle treatments are scorned as horse and buggy medicine. He asked the question: How did patients fare before the wonder drugs were discovered? The old literature showed that with few exceptions the ordinary asthmatic attack abated spontaneously.

But this fact has been forgotten apparently, and through the there has been built up a do-it-yourself treatment tendency on the part of patients, especially when the antihistamines, amines and steroid hormones came along.



Patients with simple kinds of asthma have come to believe they won't survive an attack unless they quickly administer their drugs.

Reviewing his own experience with such patients, Dr. LeRoy found they had certain common features. All were impatient individuals who wanted relief in a hurry when their breathing was embarrassed. They had long histories of frantic trips to the emergency room and urgent calls for help, usually at night.

While he pondered the possibility of managing these special patients without the help of their handy little nebulizers, Dr. LeRoy fortified himself with the experience and opinions of medical predecessors.

Now he has no hesitancy in questioning all but a very few patients to give up their medicines. The control of medication is transferred from the patient to the physician.

While these patients may still have an occasional asthma bout, they do not go into the hysterical shortness of breath, exhaustion and collapse that used to mark their fears.

From a world that has become too small, we are moving out into one that will be forever too large"

# WE'LL NEVER CONQUER SPACE

by Arthur C. Clarke

MAN will never conquer space. Such a statement may sound ridiculous now that our rockets are ready 100 million miles beyond the moon and the first human travelers are preparing to leave the atmosphere. Yet it expresses a truth which our forefathers knew: one we have forgotten—and our descendants must learn again in heartbreak and loneliness.

Our age is in many ways unique. It is full of events and phenomena which have never occurred before and can never happen again. They distort our thinking, making us believe that what is true now will be true forever. Though perhaps on a larger scale because we have annihilated distance on this planet, we imagine that we can do it once again. The facts are far otherwise, and we will see them more clearly if we forget the present and turn our minds towards the past.

To our ancestors the vastness of the earth was a dominant fact controlling their thoughts and lives. In all earlier ages than ours the world was wide indeed, and no man could ever see more than a tiny fraction of its immensity. A few hundred miles



—a thousand at the most—was in fifty. Only a lifetime ago parents waved farewell to their emigrating children in the virtual certainty that they would never meet again.

And now within one incredible generation all this has changed. Over the seas where Odysseus wandered for a decade the Rome-Beirut Comet whispers its way within an hour. And above that the clock satellites span the distance between Troy and Ithaca in less than a minute.

Psychologically as well as physically, there are no longer any remote places on earth. When a friend leaves for what was once a far country, even if he has no intention of returning, we cannot feel that same sense of irrevocable separation that saddened our forefathers. We know that he is only hours away by jet liner and that we have merely to reach for the telephone to hear his voice.

In a very few years when the satellite communication network is established we will be able to see friends on the far side of the earth as easily as we talk to them on the other side of the town. Then the world will shrink no more for it will have become a dimensionless point.

### Forever Too Large

But the new stage that is opening up for the human drama will never shrink as the old one has done. We have abolished space here on the little earth, we can never abolish the space that yawns between the stars. Once again we are face to face with immensity and must accept its grandeur and terror, its inspiring possibilities and its dreadful restraints. From a world that has become too small, we are moving out into one that will be forever too large, whose frontiers will recede from us always.

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Arthur C. Clarke, a fellow of the Royal Astronomical Society of England, is a prolific writer in the field of space, his most recent book being *The Challenge of the Spaceship*.

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more swiftly than we can reach towards them.

Consider first the fairly solar, or planetary, distances we are now preparing to assault. Very first Lunik made a substar impression upon them, traveling more than 200 million miles from the earth—six times the distance to Mars. When we have harnessed nuclear energy for spaceflight, the solar system will contract until it is little larger than the earth today. The remotest of the planets will be perhaps no more than a week's travel from the earth while Mars and Venus will be only a few hours away.

This achievement which will be witnessed within a century, may appear to make even the solar system a comfortable homely place with such giant planets as Saturn and Jupiter playing much the same role in our thoughts as do Africa and Asia today. (Their qualitative differences of climate, atmosphere, gravity, fundamental though they are, do not concern us at the moment.) To some extent this may be true. Yet as soon as we pass beyond the orbit of the moon, a mere quarter million miles away, we will meet the first of the barriers that will separate the earth from her scattered children.

The marvelous telephone and television network that will soon embrace the whole world, making all our neighbors cannot be extended into space. It will never be possible to converse with anyone on another planet.

Do not misunderstand this statement.

ment Even with today's radio equipment, the problem of sending speech to the other planets is almost trivial But the messages will take minutes—sometimes hours—on their journey because radio and light waves travel at the same limited speed of 186 000 miles a second

Twenty years from now you will

verbal messages is possible—but not a conversation

Even in the case of the nearby moon the  $2\frac{1}{2}$  second time lag will be annoying At distances of more than a million miles it will be intolerable

### Time Barrier

To a culture which has come to take instantaneous communication for granted as part of the very structure of civilized life this time barrier may have a profound psychological impact It will be a perpetual reminder of universal laws and limitations against which not all our technology can ever prevail For it seems as certain as anything can be that no signal—still less any material object—can ever travel faster than light

The velocity of light is the ultimate speed limit being part of the very structure of space and time Within the narrow confines of the solar system it will not handicap us too severely once we have accepted

the delay in communication which it involves At the worst these will amount to 20 hours—the time it takes a radio signal to span the orbit of Pluto the outermost planet

Between the three inner worlds the earth Mars and Venus it will never be more than 20 minutes—not enough to interfere seriously with commerce or administration, but more than sufficient to shatter those personal links of sound or vision that can give us a sense of direct contact with friends on earth wherever they may be

It is when we move out beyond the confines of the solar system that we come face to face with an altogether new order of cosmic reality Even today many otherwise educated men—like those savages who can count to three but lump together all numbers beyond four—cannot grasp the profound distinction between solar and stellar space The first is the space enclosing our neighboring worlds the planets the second is that which embraces those distant suns the stars and it is literally millions of times greater

There is no such abrupt change of scale in terrestrial affairs To obtain a mental picture of the distance to the nearest star as compared with the distance to the nearest planet you must imagine a world the closest object to you is a few feet away—and then there is the star

Many conservative people, puzzled by these facts, have denied that they can

Some people never learn, those who 60 years ago scoffed at the possibility of flight, and ten (even five!) years ago laughed at the idea of travel to the planets, are now quite sure that the stars will always be beyond our reach. And again they are wrong, for they have failed to grasp the great lesson of our age—that if something is possible in theory, and no fundamental scientific laws oppose its realization, then sooner or later it will be achieved.

One day, it may be in this century, or it may be a thousand years from now, we shall discover a really efficient means of propelling our space vehicles. Every technical device is always developed to its limit (unless it is superseded by something better) and the ultimate speed

then the nearest star will be less than five years' voyaging from the earth.

Our exploring ships will spread outwards from their home over an ever expanding sphere of space. It is a sphere which will grow at almost—but never quite—the speed of light. Five years to the triple system of Alpha Centauri; 10 to the strange matched doublet Sirius A and B; 11 to the tantalizing enigma of 61 Cygni, the first star suspected to possess a planet. These journeys are long, but they are not impossible. Man has always accepted whatever price was necessary for his explorations and discoveries, and the price of Space is Time.

Even voyages which may last for

centuries or millennia will one day be attempted. Suspended animation already been achieved in the laboratory, and may be the key to interstellar travel. Self-contained communities which will be tiny traveling worlds in their own right may be another solution, for they would make possible journeys of unlimited extent, lasting generation after generation.

The famous Time Dilation effect predicted by the Theory of Relativity, whereby time appears to pass more slowly for a traveler moving at almost the speed of light, may be a third. And there are others.

Looking far into the future, therefore, we must picture a slow (little more than half a billion miles an hour!) expansion of human activities outwards from the solar system.

average five light years apart, in other words, we can never get from one to the next in less than five years.

To bring home what this means, let us use a down-to-earth analogy. Imagine a vast ocean, sprinkled with islands—some desert, others perhaps inhabited. On one of these islands a energetic race has just discovered the art of building ships. It is preparing to explore the ocean, but must face the fact that the very nearest island is five years' voyaging away, and that no possible improvement in the technique of ship building will ever reduce this time.

In these circumstances (which

use in which we will soon find ourselves) what could the islanders believe? After a few centuries, they might have established colonies on any of the nearby islands and have easily explored many others. The tougher colonies might themselves have sent out further pioneers and a kind of chain reaction would spread the original culture over a rapidly expanding area of the ocean. But now consider the effects of an inevitable unavoidable time lag there could be only the most tenuous contact between the home island and its offspring. Returning messengers could report what had happened on the nearest colony—five years ago. They could never bring information more up to date than that and dispatches from the more distant parts of the ocean would be even still further in the past—perhaps centuries behind the times. Here would never be news from the other islands but only history.

### Independent "Colonies"

All the star borne colonies of the future will be independent whether they wish it or not. Their liberty will be inviolably protected by Time as well as Space. They must go their own way and achieve their own destiny with no help or hindrance from Mother Earth.

At this point we will move the discussion on to a new level and deal with an obvious objection. Can we be sure that the velocity of light is indeed a limiting factor? So many impassible barriers have been battered in the past, perhaps this

one may go the way of all the others.

We will not argue the point or give the reasons why scientists believe that light can never be outraced by any form of radiation or any material object. Instead let us assume the contrary and see just where it gets us. We will even take the most optimistic possible case and imagine that the speed of transportation may eventually become infinite.

Picture a time when by the development of techniques as far beyond our present engineering as a transistor is beyond a stone axe we can reach anywhere we please instantaneously with no more effort than by dialing a number. This would indeed cut the universe down to size and reduce its physical immensity to nothingness. What would be left?

Everything that really matters. For the universe has two aspects—its scale and its overwhelming mind numbing complexity. Having abolished the first we are now face-to-face with the second.

What we must now try to visualize is not size but quantity. Most people today are familiar with the simple notation which scientists use to describe large numbers. It consists merely of counting zeroes so that a hundred becomes  $10^2$ , a million  $10^6$ , a billion  $10^9$  and so on. This useful trick enables us to work with quantities of any magnitude, and even dense budget totals look when expressed as \$5.76  $\times 10^8$  instead of \$576,000,000.

The number of other



own galaxy (that is, the whirlpool of stars and cosmic dust of which our sun is an out of town member, lying in one of the remoter spiral arms) is estimated at about  $10^{11}$ —or written in full 100 000 000 000. Our present telescopes can observe something like  $10^9$  other galaxies and they show no sign of thinning out even at the extreme limit of vision.

There are probably at least as many galaxies in the whole of creation as there are stars in our own galaxy but let us confine ourselves to those we can see. They must contain a total of about  $10^{11}$  times  $10^9$  stars or  $10^{20}$  stars altogether. 1 followed by 20 other digits is of course a number beyond all understanding.

Before such numbers even spirits brave enough to face the challenge of the light years must quail. The detailed examination of all the grains of sand on all the beaches of the world is a far smaller task than the exploration of the universe.



And so we return to our opening statement. Space can be mapped and crossed and occupied without definite limit but it can never be conquered. When our race has reached its ultimate achievements and the stars themselves are scattered no more widely than the seed of Adam even then we shall still be like ants crawling on the face of the earth. The ants have covered the world

but have they conquered? What do their countless colonies know of it, or of each other?

So it will be with us as we spread outwards from Mother Earth loosening the bonds of kinship and understanding, hearing faint and isolated rumours at second—or third—or thousandth hand of an ever dwindling fraction of the entire human race.

Though Earth will try to keep touch with her children in the all the efforts of her archivists, historians will be defeated by time and distance and the sheer bulk of material. For the number of distant societies or nations, when our race is twice its present age may be greater than the total number of the men who have ever lived in the present time.

We have left the realm of human comprehension in our vain effort to grasp the scale of the universe must always be sooner rather than later.

When you are next outdoors, on a summer night turn your head upwards towards the zenith. Almost vertically above you will be shining the brightest star of the northern skies—Vega of the Lyre 26 years away at the speed of light near enough to a point of no return for us short-lived creatures. Past this blue-white beacon 50 times as brilliant as our sun we may send our minds and boxes but never our hearts.

For no man will ever turn homeward from beyond Vega, to again those he knew and loved on the earth.

# What To Do-- When Poisons Strike Home!

**W**HAT are you doing to protect your family against common household poisonings? Every year more than 4 million Americans are injured and 27 000 killed in home accidents. Many are poisonings most are unnecessary. Children are often the victims of adult negligence. All household poisonings are divided into three categories by the National Safety Council.

**CATEGORY ONE** *If the patient is unconscious:* a) take him to the nearest hospital immediately, b) take the poison container label remaining contents any vomited material, c) have someone notify your doctor.

**CATEGORY TWO** *If the patient has swallowed kerosene gasoline or irritatives such as lye strong acids or alkalis:* a) take patient to the nearest hospital immediately, b) have someone call your doctor.

**CATEGORY THREE** *In all other cases:* a) dilute contents of stomach by giving large quantities of warm water, b) read the label on the container of poisonous substance and use patient antidote recommended, c) if no antidote is recommended or you do not have it available give one tablespoon of the Universal Antidote (see page 60).

In cases of poisoning knowing what *not* to do is just as important

as knowing what to do. Here are five don'ts.

**DON'T** spend valuable time telephoning. **ACT FIRST!**

**DON'T** give an unconscious person anything to drink. Take him to a hospital immediately.

**DON'T** try to make a patient vomit if poison is a lye or strong acid or alkali. This serves only to aggravate throat and gullet burns.

**DON'T** try to make patient vomit if poison is kerosene, gasoline or solvent.

**DON'T** destroy poison container or label and **DON'T** dispose of remaining contents or any vomited material until diagnosis is made.

Prevention, however, is the goal. Here are some simple safeguards suggested by the AMA and the National Safety Council: nonedible items must not be stored on food shelves; items for external use only should be stored separately in a corner of the medicine cabinet; do not transfer poisonous substances to unlabeled containers; identify poisons by adhesive taping lids or sticking pins in cork so they are identifiable by touch.

**DON'T** give prescription medicines to anyone except the person for whom prescribed; never give or take medicine in the dark; never tell children they are getting candy when

own galaxy (that is, the whirlpool of stars and cosmic dust of which our sun is an out of town member, lying in one of the remoter spiral arms) is estimated at about  $10^{11}$ —or written in full 100 000 000 000. Our present telescopes can observe something like  $10^9$  other galaxies and they show no sign of thinning out even at the extreme limit of vision.

There are probably at least as many galaxies in the whole of creation as there are stars in our own galaxy but let us confine ourselves to those we can see. They must contain a total of about  $10^{11}$  times  $10^9$  stars or  $10^{20}$  stars altogether. 1 followed by 20 other digits is of course a number beyond all understanding.

Before such numbers even spirits brave enough to face the challenge of the light years must quail. The detailed examination of all the grains of sand on all the beaches of the world is a far smaller task than the exploration of the universe.



And so we return to our opening statement. Space can be mapped and crossed and occupied without definable limit but it can never be conquered. When our race has reached its ultimate achievements and the stars themselves are scattered no

but have they conquered it—what do their countless colonies know of it or of each other?

So it will be with us as we spread outwards from Mother Earth loosening the bonds of kinship and understanding hearing faint and belated rumours at second—or third—or thousandth hand of an ever dwindling fraction of the entire human race.

Though Earth will try to keep in touch with her children in the end all the efforts of her archivists and historians will be defeated by time and distance and the sheer bulk of material. For the number of distant societies or nations when our race is twice its present age may be greater than the total number of the men who have ever lived up to the present time.

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The ants have covered the world

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**DON'T** give prescription medicines to anyone except the person to whom prescribed. never medicine in the dark. never when they are getting

they are given medicine, read labels before giving or taking medicine—check dosages carefully

Dispose of medicines no longer needed by flushing down toilet immediately, and never re-use containers of chemical items

Finally, remember many substances—household commercial, industrial—not labeled *poison* can be poisonous, especially if taken by a child. Large quantities of aspirin for instance can be fatal. Don't take a chance—treat as a poison any substance eaten by a child that is not food.

Dr. Harold Jacobziner, New York Department of Health, stated that more children under 5 years of age in New York died last year from accidental poisonings than from diphtheria, poliomyelitis, rheumatic fever, scarlet fever and other streptococcal diseases combined.

Here is a general antidote for a great many poisons. Your druggist should have it. If not, ask him to use this recipe. Keep it on hand at all times.

**Universal Antidote (purchased)**

- 2 tablespoons pulverized charcoal
- 1 tablespoon magnesium oxide
- 1 tablespoon tannic acid

Dosage: 1 heaping tablespoon in small glass of water

The following is a substitute for the regular Universal Antidote

**Universal Antidote (Made at home)**

- 1 slice toast, burned black and crumbled
- 1 tablespoonful Milk of Magnesia
- 1 cup strong tea, warm or cold

## POISONS

- Acids • 18
- Bichloride of Mercury • 6
- Camphor • 1
- Carbon Monoxide • 16
- Chlorine Bleach • 8
- Disinfectant
  - with chlorine • 8
  - with carbolic acid • 12
- Food Poisoning • 11
- Furniture Polish • 17
- Gasoline, Kerosene • 17
- Household Ammonia • 11
- Insect & Rat Poisons
  - with arsenic • 2
  - with sodium fluoride • 14
  - with phosphorus • 5
  - with DDT • 11
  - with strychnine • 15
- Iodine Tincture • 4
- Lye • 10
- Mushrooms • 11
- Oil of Wintergreen • 9
- Pine Oil • 17
- Rubbing Alcohol • 9
- Turpentine • 17
- Washing Soda • 10

## OVERDOSES

- Alcohol • 9
- Barbiturates • 3
- Belladonna • 15
- Bromides • 11
- Codeine • 13
- Headache & Cold
  - Compounds • 9
  - Salicylates (aspirin) •
- Iron compounds • 7
- Morphine, Opium • 13
- Paregoric • 13
- 'Pep' Medicines • 2
- Sleeping Medicines • 3

## do this first

Send for a doctor—immediately.

Keep the patient warm.

Determine if patient has taken

(1) A **POISON**—something not

meant to be taken internally. . or

(2) AN **OVERDOSE**—a food or

drug taken in excessive quantity.

While waiting for physician, give

appropriate counterdose below.

● But do not force any liquids on the patient—if he is unconscious.

## To Find the Correct Counterdose

● In one of the lists printed at left, find substance causing the trouble.

● Next to that substance is a number. This refers to counterdose bearing same number in the section below.

## Keep all poisons and medicines out of reach of children

<p>Induce vomiting with an emetic such as</p> <ul style="list-style-type: none"> <li>• Tablespoon of mustard in half glass of water, or</li> <li>• Soap &amp; warm water, or</li> <li>• Salt &amp; warm water, or</li> <li>• Finger in throat</li> </ul>	<p><b>2</b> • Give a mixture of 2 tablespoons of activated charcoal 1 tablespoon of milk of magnesia, 6 tablespoons strong tea</p> <ul style="list-style-type: none"> <li>• Induce vomiting (#1)</li> </ul>	<p><b>3</b> • Give mixture as in #2.</p> <ul style="list-style-type: none"> <li>• Induce vomiting (#1)</li> <li>• Give 2 tablespoons epsom salt in 2 glasses of water</li> <li>• Then give large quantities of hot coffee or strong tea (instant or regular).</li> </ul>
<p><b>4</b> • Give 2 ozs thick starch paste Mix cornstarch (or flour) with water</p> <ul style="list-style-type: none"> <li>• Then give 2 ozs salt in quart of warm water Drink until vomit fluid is clear</li> <li>• Finally, give glass of milk</li> </ul>	<p><b>5</b> • 4 oz hydrogen peroxide • 1 tablespoon sodium bicarb in quart of warm water</p> <ul style="list-style-type: none"> <li>• Induce vomiting (#1)</li> <li>• Then give 4 oz mineral oil Positively do NOT take vegetable or animal oil</li> </ul>	<p><b>6</b> • For each tablet swallowed give white of 2 raw eggs in glass of milk</p> <ul style="list-style-type: none"> <li>• Give mixture as in #2</li> <li>• 1 ounce of epsom salt in a pint of water.</li> </ul>
<p><b>7</b> • Induce vomiting (#1)</p> <ul style="list-style-type: none"> <li>• Give 2 teaspoons of sodium bicarb in a glass of warm water</li> </ul>	<p><b>8</b> • Give 1 teaspoon of aromatic spirit of ammonia in glass of water</p> <ul style="list-style-type: none"> <li>• Hot coffee or strong tea plus white of raw egg</li> </ul>	<p><b>9</b> • Give mixture as in #2.</p> <ul style="list-style-type: none"> <li>• Induce vomiting (#1)</li> <li>• Tablespoon sodium bicarb in quart of warm water</li> <li>• Give strong tea or coffee</li> </ul>
<p><b>10</b> • Give 2 tablespoons vinegar in 2 glasses of water</p> <ul style="list-style-type: none"> <li>• Give white of 2 raw eggs or 2 ounces of olive oil</li> <li>• Do NOT induce vomiting!</li> </ul>	<p><b>11</b> • Induce vomiting (#1)</p> <ul style="list-style-type: none"> <li>• Give 2 tablespoons epsom salt in 2 glasses of water</li> <li>• Then give large quantities of hot coffee or strong tea</li> </ul>	<p><b>12</b> • Induce vomiting (#1)</p> <ul style="list-style-type: none"> <li>• Then give 2 ounces of castor oil</li> <li>• Next give glass of milk or whites of 2 raw eggs.</li> </ul>
<p><b>3</b> • Give mixture as in #2</p> <ul style="list-style-type: none"> <li>• 2 tablespoons epsom salt in 2 glasses of water</li> <li>• Keep patient awake</li> </ul>	<p><b>14</b> • Give 2 tablespoons milk of magnesia</p> <ul style="list-style-type: none"> <li>• Give glass of milk</li> <li>• Induce vomiting (#1)</li> </ul>	<p><b>15</b> • Give mixture as in #2</p> <ul style="list-style-type: none"> <li>• Give artificial respiration.</li> <li>• Keep patient quiet.</li> </ul>
<p><b>16</b> • Carry victim into fresh air</p> <ul style="list-style-type: none"> <li>• Make patient lie down</li> <li>• Hot coffee or strong tea</li> </ul>	<p><b>17</b> • Give 4 oz mineral oil</p> <ul style="list-style-type: none"> <li>• Then give hot coffee or strong tea</li> </ul> <p>©American Druggist</p>	<p><b>18</b> • Give 1 oz milk of magnesia in quantity of</p> <ul style="list-style-type: none"> <li>• Do NOT in</li> </ul>



# How To Live Longer

New Views About Aging and Ways to Halt It

by Roy Gibbons

Condensed from *The Chicago Tribune*

**S**CIENTISTS are hard at work trying to fathom the mystery of why humans grow old

The scope of the inquiry into aging is indicated by a 939 page volume entitled the *Handbook of Aging and the Individual*, released recently by the University of Chicago Press

Doctor James E. Birren, a psychologist and chief of the section on

aging of the National Institute of Mental Health at Bethesda, Md., is editor of the volume to which 26 scientists and scholars have contributed. Dr. Birren says that research on aging is new and that only the frontiers of the subject have been touched.

It is also his opinion, to which many other investigators subscribe, that longevity is a matter of heredity, provided a person escapes the scarring effects of disease and other biological injuries.

Because medical science has made great strides in the conquest of many

fectious ailments, Dr Birren believes that when the youth of today reaches old age there might very well be a different kind of old people.

It is wholly conceivable, he says, that within 25 years a person who is 75 years old may have the biological age of today's 65 year old, because he will have been subjected to fewer diseases in his lifetime.

In other words, Dr Birren explains, a person is born into the world with a certain amount of vital capital. If this biological currency is not been paid out in the contest of infection, the person will be left with greater reserves for a longer voyage in the ship called life. Many scientists contend there is no definite proof that old age is not the result of some specific process, such as a toxin impairing the body's vital functions.

More are inclined to believe, however, that senescence comes from a breakdown of organ systems such as the heart, the liver and the kidneys.

Doctor Albert I. Lansing of the University of Pittsburgh School of Medicine says on this score: "Quite apart from the capacity of duplication of whole organisms by reproduction and cell duplication by mitosis (division), there is a truly remarkable ability of protoplasm to renew itself as it is consumed by vital activities."

Shoes, piston rings and automobile tires wear out because of increased friction. Rubber bands stretch and become inelastic with the passage of time and clocks run down.

None of these failures, Dr Lansing says, is the same as the aging of living things.

Another scientist has asked: "What mechanism is it which permits such abundant growth and cell division up to maturity and then not only brings these processes to an end but to a steady and fatal decline?"

### Long-Life Serum?

Along this line of reasoning, the late Dr. Alexander A. Bogomolets, a Russian scientist, created in 1940 quite a stir in medical circles by announcing development of a serum for prolonging human life.

It was Bogomolets' contention that humans should live at least 150 years, and to this end he devised his anti-aging preparation which was called A.C.S. meaning antireticular cytotoxic serum.

The substance derived from the blood of horses into which human spleen and bone marrow had been injected was supposed to stimulate what is known as the body's reticulo-endothelial system—a network of cells found in all tissues but concentrated especially in the liver, spleen, and bone marrow.

These cells found in all living creatures are concerned with the maintenance and repair of tissues. One of their functions is to act as scavengers by digesting cellular debris and also repel invasion by harmful bacteria.

The serum allegedly showed beneficial results in wound healing and was also said to have rejuvenated some human subjects. It never won ac-



ceptance in this country but was widely acclaimed in Russia and France

Further work on the serum was abandoned in 1946 when Bogolomets died of what the Soviet Council of Ministers termed a "grave disease" Whether he took his own medicine was not disclosed

Many other views about aging and ways to halt it have been advanced



by hundreds of other persons most of them not scientists who were consulted simply because they happened to live for a long time

One such individual—a 4 foot 4 inch South American Indian—was subjected to rigorous medical examination by New York City medical authorities in 1956 when the wizened ancient from Colombia claimed to be 176 years old

Doctors said Javier Pereira who died in 1958 might have been 150 when they saw him but admitted lack of any scientifically foolproof method to affirm or deny his exact age

Through an interpreter, Pereira professed to recall events from the days of Simon Bolivar, who died in 1830 after liberating much of South America from Spanish rule

Medical tests showed the spry little Indian's blood circulation was that of a youngster and that his heart and blood pressure had un-

usual vigor He said he drank he could get it, smoked when to do so, and had outlived wives

Other oldsters have ascribed longevity to a variety of causes many of them of dietary origin including indulgence in, or complete abstinence from such things as whisky tobacco, wild onions vegetables, and a long list of other substances

In some European countries beetroot is eaten exclusively by persons who claim it has medicinal value For every theory promulgated to add years to the normal life span there are contrary views which nullify the idea

Very few humans really die of old age it is claimed Death usually comes from some intervening cause associated with the breakdown of vital processes such as the cardiovascular system which today afflicts most senior citizens or failure of one of the organs such as the kidney or liver which give little warning until they start getting into trouble

Exceptions to this rule do occur One was Walter W Williams Confederate veteran and last of a line of 4 million men who fought in the Civil war

He died last Dec 19 at 117, still recovering from another bout with pneumonia The physician who attended him said Williams did not succumb to any observable disease or breakdown but of a general wearing out true of old age

The old soldier's veins and arteries were easily compressible and sim-

■ e of a man 70 it was reported doctor ascribed Williams's un-  
l longevity to heredity and to a  
l life free of stress and tension

### Days Not Meaningful

he measure of a man's age ■ best  
rmined by the number of his  
days—his chronological age  
ctually this is the least mean-  
al kind of measurement because  
umans do not grow old uni-  
lv. Moreover a man of 60 let  
ay might very well have a body  
ell preserved as that of a much  
nger person.

is likewise true that the age of  
various organs may vary in the  
e individual. Thus a 60 year old  
might have 30 year old eyes  
a 40 year old liver. The opposite  
ourse ■ equally true.

Investigators have been turning  
some leads which though not too  
nite show promise of cracking  
ts of the riddle of aging.

One procedure having to do with  
lood test for determining the state  
biological aging is under investi-  
ion at Creedmoor Institute for  
chobiologic Studies at the Creed-  
or State hospital New York  
ere it was developed by Dr. Leon-  
e Goldschmidt.

he test confirms by microscopic  
hiques that humans do not age  
the same rate. (See SCIENCE  
GIST May 60—Ed.)

In addition to the blood test for  
ing there ■ also what ■ called  
e skin test, which any person may  
rform to give some indication of  
s biological years.

To make this test simply lift up  
the skin on the back of the hand  
and hold it there for a moment or so.  
In biologically young persons the  
skin when released will quickly as-  
sume its normal position. But if the  
person is old both in years and more  
importantly by biological stand-  
ards a ridge will be maintained for  
more than half a minute or so.

The reason the old skin cannot  
recover so rapidly is because it has  
lost its elastic fibers. It is explained  
Young skin on the other hand is  
able to snap back into place almost  
immediately. This is part of the  
bounce which goes with youth.

Doctor Frederick C. Swartz of  
Lansing Mich. chairman of the  
committee on aging of the American  
Medical Association says there are  
practically no diseases peculiar to  
the aged.

There are simply diseases among  
the aged which is ■ far different  
thing. Dr. Swartz contend. Hard



ening of the arteries is no worse than  
softening of the will to live.

Many people feel old one day and  
young the next. It is a matter of  
mental attitude, authorities explain.  
Because the aging process is so com-  
plicated many experts say they  
doubt whether most persons really  
know their own age.

Studies conducted by sociol-  
ogists and psychologists have dis-  
covered that many well-adjusted

women who have passed the 60 and 70 year mark, and are even in their 80s still think of themselves as middle aged

Doctor Edward L. Bortz of Philadelphia former A.M.A. president and president elect of the American Geriatrics society also stresses the importance of proper motivation as a life saving attitude for the nation's senior citizens

To taste the rich essence of mature living one must drink deeply to enjoy the real savor of life at its best Dr Bortz says It is an invitation to growth to an enlarging experience



The extended life span which we all can now attain requires an eager desire to keep going to keep growing It is an exceedingly personal quality If enforced retirement results in an aimless leisure inevitable deterioration usually occurs

Since 1950 the number of Americans 65 and over has jumped to 15 million Population experts predict it will climb to approximately 30 million by 1980 while the percentage of those between ages 25 and 44 will decline

There is every reason to believe that in living longer humans of the future are certain to be healthier in both body and mind says Dr Theodore G. Klumpp a member of the

American Medical Association's committee on aging

Our older citizens are than they used to be Medicine has not only added their lives but is making rapid progress in adding life to their years even more important objectives in the practice of geriatrics the experts contend

### Don't Raise Your Voice

Doctor Morris Fishbein Ch. medical educator and former editor of the *Journal of the American Medical Association* says that of progress being achieved by medical research makes it entirely conceivable that 10 to 20 useful years will be added to the average life span in the not too distant future

To live a long time don't raise your voice he advises By speaking in calm tone you avoid one of the principal causes of aging

Stress activates the body's glandular system putting strain on defense mechanisms stress factor also includes the position of physical hurts and pressures such as worry about having too little or too much of the world's goods he explained

Doctor Fishbein said that progress is being made to help the elderly retain their vigor Such strides are seen in new enzyme preparations and glandular extracts including those from the thyroid found in the neck and the pituitary, the body's master gland situated in the brain he disclosed

New kinds of pituitary su-

on the verge of being introduced into the medical profession, he revealed. The preparations contain readily isolated growth factors that control such things as pigmentation of the skin and even the growth of

It looks as if we finally may be able to do something about hair," Dr. Fishbein said. This is so important for humans. But the new substances work, they will mean a lot to farmers by increasing the wool yield from sheep. "Another achievement, he said, is the development of a new kind of amino acid, one of the basic substances or building blocks from which all protein is made.

The brain cells are rich in glutamic acid which previously has been administered in attempts to increase the intelligence levels of mentally retarded children. It also is given to older persons to improve their nutrition, especially in instances where the cerebral arteries are hardened to produce senility. The new glutamic acid preparation seemingly is able to pass an obstruction called the blood brain barrier, and thus enriches the brain in their need for this substance. Doctor Herman N. Bundesen, a 1940's veteran health commissioner, has his own method for keeping young.

Bundesen, who was 78 on April 1, says his health is excellent and

off surplus poundage, which he indicates as one of the principal causes of premature death and aging, is his own brand of abdominal exercise.

Every day, for at least two hours, and during what he terms "wasted time," he moves his abdomen up and down, drawing the visceral contents upward in the direction of his chest.

This kind of silent manipulation, he asserts, squeezes the liver, kidneys, spleen and other internal organs and also aids the prostate gland.

"Anyone can do this exercise and do it on wasted time," Bundesen says. "Wasted times are those inter-



vals when you are talking on the telephone, listening to people, waiting for a bus."

The procedure, according to Bundesen, squeezes all the fat out of the internal organs and gives muscle tone to the abdomen.

Bundesen weighs 155 pounds and hasn't varied more than two pounds from that mark in years. He has been doing the exercise for at least 25 years.

## 7 Rules for Staying Young

The way to a ripe old age, through pills, tonics, or rejuvenation, the American Medical Association concludes. It recommends these seven rules to strengthen spirit, body and mind.

1. See your family phy-

Bundesen's technique for fighting

women who have passed the 60 and 70 year mark and are even in their 80s still think of themselves as middle aged

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1 See your family physician reg-

ularly He can diagnose and treat almost any disease if he finds it early enough He can help you stay young

2 Watch your diet No one can feel young and peppy when he's toting an extra load of weight

3 Get adequate rest for both your mind and body Your body is a machine and your brain is its pilot and both can weary from over exertion Take each job as it comes and don't tackle everything at once

4 Pursue physical exercise The mark of an old man or woman is creaking joints aching backs and a myriad of complaints Keep all the parts in good working order by using them A mild amount of exercise never hurt anyone in good health—such as mowing the lawn a brisk walk to work or any moderate sport that expels the poisons of fatigue and prevents the rust of idleness

5 Fill your days with productivity The quickest way to old age is

through boredom so keep up interest in your work and roundings Fifty years ago a woman of 65 was ready for an arm chair But that certainly isn't true today

6 Participate in community affairs Some people pursue the life of fussing and fretting about themselves at home alone But you want to be among the happy people—the doers—share your talents

7 Prepare for your future financial needs Many worries about tomorrow can be avoided if you plan today There are now many excellent retirement programs available to individuals and employees which assure you a continuing comfortable income during retirement Budgeting for medical needs can be achieved through private health insurance

Remember you can stay young only if you're prepared for the future and that is as near as tomorrow



## Silver Is Given New Atomic Weight

AN ATOM of silver weighs less than previously thought but this new finding of the National Bureau of Standards will not affect the silver dimes in your pockets

The new atomic weight of silver was set at 107.865 through accurate measurements with a mass spectrometer The atomic weight currently used is 107.870

A pound of silver will still be a pound

of silver to the layman but a chemist a pound of silver will be—theoretically at least—more than it formerly did

The more precise atomic weight of silver may mean that the weights of other elements may also be adjusted Silver has been used to calibrate the atomic weights of certain elements

Biggest radio telescopes show  
how we might receive signals

## Trying to Talk With Other Planets

by Arthur Koestler

lensed from *The London Observer*

WE ARE MOVING into the space age much faster than the news rates. The news is mainly concerned with rockets and satellites which are clumsy hardware slowly creeping through cosmic suburbia.

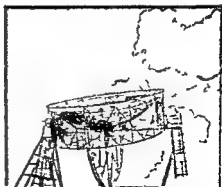
near Manchester, England, to bounce back to the same city. This experiment was performed when Venus was 30 million miles from us.

in establishing radio communication with other planets in our sky. This contains some 100 000 million stars and if only one in a million among these has a planetary system comparable to ours there

would still be, by the laws of probability, 100 000 of them inhabited by some sort of intelligence, floating through the Milky Way.

On the very day of my visit to the Jodrell Bank telescope, the papers had published a letter from two American astronomers suggesting that the telescope's operators should make a point of listening in to possible meaningful signals even suggesting the most likely wave lengths for communication.

While driving to Jodrell Bank, Prof. Lovell of Manchester University who heads the telescope team discussed with me the subject of interplanetary semantics—with that face-saving semiseriousness which is the fitting scholarly attitude on approaching the fantastic. Assuming that one day on a certain wave length and from a certain direction in space the little pen which records the incoming impulses in red ink on





the revolving drum was obviously trying to say something—that is, that the sequence of impulses displayed a clearly articulated pattern, as, for instance, a Morse signal sequence—what is one to do next?

Evidently one would try to 'break the code' of the sequence of blip blips. This, however, presupposes some common language and the only imaginable common language with the bug eyed inhabitants of an other planet would be the language of mathematics. If the signal were, for instance 9 16 25 we would know at once that they are familiar with the Pythagorean theorem and it would then perhaps become possible to establish a common symbolic language which would embrace quantitative relationships and also a good deal of formal logic.



It may or may not also be possible to identify and name chemical elements (by repeating the sequels of atomic numbers or the spacings of their linear spectra) and so get to chemical compounds.

But whether we would ever succeed by this method in conveying the meaning of 'We have four legged animate things which bark and bite' not to mention 'And how does the wise man? As the fool?' is a fascinating problem for linguistic philosophers.

Helen Keller was born deaf and

*The London Observer* © 1960 by the New York Herald Tribune Syndicate 230 West 41st St. New York 36 N.Y.

blind, and the first break in communication was through signals which her teacher placed into her hand. But firstly both equipped with the same of cerebral computer, and the teacher could place the hand on the object while naming symbols.

An additional difficulty is the planets around our own sun almost certainly unfit to support higher forms of life as we understand it and the closest alien Alpha Centauri is five light years away. By the laws of physics we cannot expect the nearest to have suitable planets. This means that to get an answer to a question will take a minimum of fifty more likely several hundred years. It will be a game of cosmic chess of Olympian duration.

We need not however wait for the answer and could go on transmitting a whole correspondence course in symbolic logic until a century or so the answers begin to arrive. The method might of course give rise to some slight misunderstandings.

However opinions on this matter are sharply divided. While the enthusiasts at Jodrell Bank are convinced that radio communication with planets in the neighboring regions of our galaxy is feasible virtually within reach Prof. Fred Hoyle, who occupies the chair of Astronomy at Manchester University, is of the opposite opinion.

While Jodrell Bank believes that about one megawatt would be

to reach out to Alpha Centauri and beyond, Kopal believes we shall never be able to generate sufficient energy to send pulses of radio—short of blowing up our

reason for this astonishing difference of opinions is partly our ignorance of the exact conditions existing in interstellar space and the newness of radio astronomy. Not since the days of Galileo's telescope was there such uncertainty as to what a new gadget could and could not do.

### Pyramid Is 'Creepy' Thing

Just as we arrived at the foot of the mysterious floodlit Thing. Even though I had seen photographs of it, the sight surpassed expectation. The pyramids and the Sphinx are a disappointment to the tourist because of their balanced proportions. I was almost blind to them, almost unaware of their huge

scale. The monster telescope of the Bank is a surrealistic, creepy thing, a single gigantic hollow cylinder, an eye made of steel, 80 yards in diameter over an acre in surface area, divided between two lattice towers. Trains actually creep on electrically driven bogies around a circular track 350 feet in diameter to counteract the earth's rotation, and the hollow eye itself moves up or down on its gear of pulleys and racks taken from the hoists of the erstwhile British battleship *Royal Sovereign*.

On a wet day that hollow eye can collect four tons of rain but

## NEXT MONTH IN SCIENCE DIGEST

### WHAT'S IT LIKE ON THE MOON?

*Dr. Harold C. Urey, Nobel prize winning chemist, tells what space explorers can expect when first they land on the moon's surface and discusses the design problems we're encountering in engineering a vehicle to take them there.*

### YOU CAN KEEP COOL

*A doctor of medicine describes the deadly effects of strong sunlight and tenders sane advice on how to enjoy the summer and at the same time avoid heat stroke and heat exhaustion.*

### DETECTING ART FAKES

*It's now easier to spot forged masterpieces thanks to the development of an instrument called the electron microbeam probe. A fascinating account of the forger's bag of tricks and how they are exposed by honest investigators.*

*and many other sound and stimulating articles about what this changing world of science means to you*

for the ducts through which it weeps them away. Suspended beneath the center of the eye is a laboratory, hanging on pivots. On its rims, the eye carries red and green navigation lights to warn off low flying aircraft.

Altogether this Thing has a kind of colossal impertinence. An optical telescope, however large, is a glorified opera glass, watching the stars. But this naked parabolic steel

ister like an empty eyesocket, and yet it can penetrate farther into space, it does not watch, it spies by means of invisible waves emitted by invisible sources

The largest telescope has a range of about 2 000 million light years, the eye at Jodrell Bank is believed to be catching pulses emanating from even more distant sources

One is tempted to ask: What does it matter? since imagination has long been defeated by the hoary deep yet it does matter and for a simple reason: We are now probing regions of the universe close to the frontier beyond which we shall never be able to penetrate regardless of any further technological progress. Again the reason is simple. In this expanding world all galactic clusters recede from one another and from us at speeds which are proportional to their distance: the farther away the faster they run.

The most distant objects reached by the optical telescope are believed

to recede at nearly half the speed of light (The speed of light is a speed of radio waves.) Double the distance and you have reached the limit—for objects which recede faster than the speed of light have gone around the cosmic bend, ever, beyond our range. Out of the world they cannot fall but as far as we are concerned they have ceased to exist.

At least that is what matters like according to present cosmological theory. This however is a state of transition and controversy which ranges from the sober question whether extensions on this scale are pertinent at all to impassioned arguments about the origin of the universe.

• • •

The monster of Jodrell Bank perhaps not decide the issue, chances are that within the next years it will contribute more to its solution than the sensations from the satellites around us.

## What Is an Ephebiatric Clinic?

THROUGH COMMON USAGE the terms 'teen ager' and 'adolescent' have lost their original meaning for both patient and parent. The general public tends to link the terms with 'juvenile delinquency'.

The patients (14 to 19 years of age) have expressed a desire for a name

more workable and less awkward than either of the older names. It seems genuinely appreciative of the change in name.

That the practice of ephebiatrics is relatively new is proven time and again when staff members drop the office asking what an ephebiatrician is. The ephebiatrician often feels a medical missionary whose fun is to define his area of interest and explain the rationale for its existence.

—The New Ph

of the old literally meaning approaching manhood the term is much

# BEFORE THE BABY IS BORN

## facts about pregnancy

by James C Spaulding

Condensed from The Milwaukee Journal

**WOMAN'S PHYSICAL SUPERIORITY** is seldom so obvious as during pregnancy. She becomes temporarily a different person as her circulation, metabolism and body chemistry change to meet the needs of the growing fetus. Her person tends to

enlarge, too. The most remarkable difference occurs in the uterus, the muscular pouch where the fertilized egg is implanted. Before pregnancy the uterus is only about 2 1/2 inches long and near solid.

Near the end of pregnancy it becomes a thin-walled muscular bag more than a foot long, nine inches wide and

10 inches deep. Its capacity has increased about 520 times and its weight, not including the contents, increased by 37 times.

Individual muscle cells in the uterus begin enlarging early in pregnancy

because of more female hormones in the blood. Later they expand from the growth of the fetus inside.

Blood and lymph vessels in the uterus expand to supply the fetus with oxygen and nutritional substances and to carry away metabolic waste products.

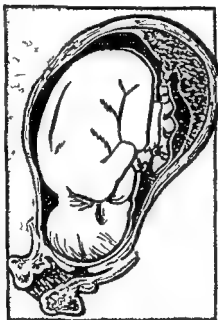
By the end of the fourth month the uterus usually becomes too large to remain within the pelvic cavity and forms a tumor in the abdomen.

It presses against the abdominal wall, pushing the intestines aside. Still later it pushes against the diaphragm, displacing the heart upward and to the left.

The chest cavity

is shortened but its circumference is increased so that there is an actual increase in the vital capacity of the lung.

Blood volume increases. To pump the 30 percent more blood the heart works harder. By the last month of pregnancy it is pumping



about  $1/3$  more blood per minute than before pregnancy

The greater tendency to faint while pregnant is caused by shunting of blood from the brain to the uterus and digestive tract. The tendency is aggravated when a woman enters a warm room from the cold outdoors because skin blood vessels dilate taking still more blood from the brain. One obstetrician said that churches and supermarkets were the most common fainting places according to reports of his patients.

Endocrine glands enlarge and produce more hormones in pregnancy. The thyroid gland in the neck grows noticeably. In ancient Rome a close fitting gold necklace was fastened around the bride's neck. When the necklace became tight it was a sign she was pregnant.

Greater thyroid function is associated with a rise in the metabolism of the fetus.

The pituitary gland in the brain sometimes doubles in size. Its increased output of hormones may be a cause of thickening of facial features in pregnancy. The adrenal glands, lying on top of the kidneys, also overgrow.

Increased secretion of female sex hormones, both by the mother and the placenta—the exchange organ between the mother and the fetus—is one of the essential changes

transfers iron to the fetus at the rate in the last one third of nancy as in the first two-thirds.

Water retained in spaces between the mother's body cells is eliminated a few days after the baby is born by excretion from the kidneys and profuse sweating.

Among about 12,000 pregnant women the average total weight gain is 24 pounds. Half of it, in the first three months and only two pounds in the first three.

About half the weight gain is accounted for by the fetus and the contents of the uterus, and the other half by the mother in fat, protein, and water in the body and blood.

Brown patches sometimes appear on the face and neck. Called 'mask of pregnancy' may be a result of excess of sex hormones.

So-called vascular spiders, fiery red elevations of blood vessels with branching legs, occur on the face, neck and upper arms. They are common on the chests of many pregnant women. Some experts believe that the concentration of female hormones in the tissues is the cause.

The old belief that a woman should have a tooth for every child has no scientific basis, but pregnancy is known to hasten existing dental decay. It is not a cause of tooth cavities, however.

Mild emotional depression is common in pregnancy, and the causes are thought to be both physical and biochemical. 'Pregnancy blues' are characterized by spells of crying or extreme irritability.

**J**UST BEFORE BIRTH, the fetus contains about an ounce of calcium in the bones. Of the mother's stored calcium almost two thirds is drawn into the last month. The mother also

ir about pregnancy are common but obstetricians believe there fewer fears now because of education and the low maternal mortality rate

Among the commoner fears are of physical attractiveness giving birth to a defective child loss of husband's love and being an inadequate mother

Cravings apparently are normal in pregnancy. A British study indicated that fruits and raw vegetables were most commonly desired among foods. Others often desired were pickles, candy and dry fruits.

Pregnant women in the study also desired such nonedible substances as soap, toothpaste, mothballs, kerosene, tar, metal polish, wood glue, chalk and charcoal.

Studies of hundreds of pregnancies show that they vary in duration from about 231 to 329 days from conception to delivery. The average is 280 days.

The upper limit can be important from a legal aspect. In 1921 an English court ruled that a baby delivered 331 days after the husband left home was legitimate.

Pregnancy after the age of 47 is rare. At Johns Hopkins hospital there was only one older reported pregnancy. The woman was 65 years old. She was 49 but was feeble-minded and might not have known her correct age.

The youngest authenticated pregnancy was Lina Medina of Lima, Peru, who was either 4 years 8 months old or 5 years 8 months old

when she was delivered of a 6 1/2 pound boy by cesarean section in 1939. Several American doctors in Peru at the time saw the mother and said she appeared to be about 5

**T**HERE ARE OCCASIONAL cases of false pregnancy or pseudocyesis. Usually this involves a woman who wants to be pregnant but fears having a baby. She develops nearly all of the normal pregnancy symptoms including weight gain, breast enlargement, cravings and even eventually labor pains.



One such case reported recently was examined by a doctor regularly through the eighth month of a presumed pregnancy, gaining 35 pounds and showing other signs.

When she was referred to a specialist for delivery, he discovered that she was suffering from pseudocyesis and told her so. This disturbed the woman but not as greatly as it did her husband. He became hysterical and had to be hospitalized and treated by a psychiatrist.

For many women, nausea and vomiting probably is the most severe problem in pregnancy. Its causes are not clearly understood but are no longer thought to be primarily psychological. 'Morning sickness,' as it is called, can be so severe that it threatens the woman's life. Drugs can help control the dis-

about  $1/3$  more blood per minute than before pregnancy

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# BOOKS

**HEART A HANDBOOK**  
**LAYMEN** by H. M. Marvin  
 (Doubleday \$4.50) Dr. Marvin  
 president of the American Heart  
 Association discusses with clarity and  
 insight the problems of heart patients  
 and their friends. This  
 book considers and discusses conflicting  
 issues on such subjects as cholesterol  
 blood and the effects of tobacco  
 on heart.

**DUT** edited by John M. Fowler  
 foreword by Adlai E. Stevenson  
 (Books \$5.50) A balanced and  
 understandable account of nuclear  
 weapons and the multitude of hazards  
 they have created for mankind. The  
 book weighs the contamination of our  
 environment, fallout, describe the results of  
 a hypothetical nuclear war and answers  
 important questions at issue on banning  
 nuclear tests.

**MYSTERIOUS EARTH** by  
 Carl Sagan (Chilton \$2.95) An  
 answer to unusual questions such as  
 "What composes the earth's center?  
 "How did our ancient ancestors giants?  
 "Are there sea serpents? Has the pole a  
 constant pattern of movement? For  
 people.

**THE BRIDGE BETWEEN**  
**WORLDS** by Franz E. Winkler  
 (Harper \$3.00) Dr. Winkler be-  
 lieves man stands poised between two  
 worlds—the outer world of fact (the  
 physical) and his own virtually unex-  
 plored world (the creative)—knowing  
 that he cannot live alone in either but

must forever make his home in both if  
 he is to continue to live. To the author  
 the cure for the illness of our time lies  
 in a systematic training of man's in-  
 tuitive faculties.

**THE POISONS IN YOUR FOOD** by  
 Wilham Longgood (Simon & Schuster  
 \$3.95) Since 1956 the author has been  
 tracking down the story of what has  
 happened to food and contends that the  
 problem of chemicals in food has built  
 up to a crisis. Some chapter headings:  
 "The Poisons You Eat" "Bug Killers  
 in Every Bite" "Test Tube Meat"

**THE WORLD OF LIGHT** by John  
 Stewart Collins (Horizon \$3.75) A  
 British journalist explains what light  
 is and what it does so that a reader  
 can understand

**ELECTRONIC COMPUTERS** by  
 T. E. Ival (Philosophical Library  
 \$15.00) This book is an introduction  
 for those who are beginning to take an  
 interest in electronic computers. How-  
 ever it is not a book for the layman  
 but rather for those persons who are  
 likely to become involved in some spe-  
 cialized aspect of electronic computing  
 either as users or as electronic designers.



(The books listed above are  
 available from SCIENCE DIRECT  
 may be obtained from their pub-  
 lishers, and, usually, from



# BUNSEN and KIRCHHOFF



## Spectroscopy

ONE OF THE MOST AMAZING achievements of the modern astronomer is that he is able to tell with such certainty and from such an incredible distance away of what materials the sun the nebulae and the stars are made.

He can tell us much about the physical state of the planets and can calculate the temperatures and pressures in the outer layers of many stars tell how dense they are and trace their electromagnetic fields. He can judge quite accurately the speeds at which certain stars and star systems are speeding towards or racing away from our own galaxy or the rate at which the components of the expanding universe are flying apart.

An instrument known as the spectroscope enables him to perform these wonders and this same device gives workers in other fields of science powers of detection and discovery just as sensational.

The criminal investigator uses the spectroscope to analyze and



by W G Lipsett

identify minute fragments of substances—clues found on the scene of a crime.

By using it the biologist can detect in animal and plant life and in the earth traces of certain health or promoting elements in amounts infinitesimal as a billionth of a gram.

With it the metallurgist can discover or control the ingredients of an alloy and it has given the physicist a picture of the movements of molecules and atoms and therefore some idea of the structure of matter itself. These are but a few of the spectroscopes many uses.

We owe the invention of the spectroscope and the development of the science of spectroscopy to two scientists—Robert Wilhelm von Bunsen and Gustav Robert Kirchhoff. Their simple invention and the engineering work which opened the way to a glittering treasure-chest of knowledge and benefit to all kinds of men.

When Bunsen and Kirchhoff teamed up in 1859, Bunsen was 48 and Kirchhoff only 35, but

already achieved much independently. Both scientists were born in Germany—Bunsen in Göttingen on December 31, 1811, and Kirchhoff at Uslungsborg in Prussia on March 12, 1824. Both men were interested in science at an early age.

### Bunsen—Practical Chemist

Bunsen's interest lay in chemistry not in theoretical speculations.

Bunsen became a lecturer in chemistry in 1839 when he was 28. He was appointed associate professor of chemistry at Marburg University in 1852, professor of experimental chemistry at Heidelberg University where he was to remain until 1889.

Bunsen first won fame by his researches into certain compounds of carbonic acid. He was a bold and adventurous person and some of his experiments almost cost him his life from accidental poisoning. In an explosion which took place in his laboratory he lost the sight of one eye. Bunsen was more than a brilliant research chemist. He was a clever inventor, interested always in the practical side of things. In 1841, he invented a new type of carbon zinc electric accumulator or cell, a useful filter pump and a series of instruments called photometers for measuring the intensity of light.

It was with his new electric or voltaic cell that he first obtained the element magnesium in metallic form and he showed how intensely it burned in air.

Although Bunsen laid the foundations of modern organic chemistry, he was chiefly interested in the study of gases. He examined the gases given off by blast furnaces in England and Germany and found that almost 80 percent of the heat was being lost in the waste of factory gases. He even went off on a scientific expedition to Iceland in 1846, to study the natural geysers so common in that land.

One of Bunsen's scientific absorptions with gases was eventually to come the invention of the burner which bears his name although some authorities say that credit for the design should go to Peter Desaga or perhaps to Michael Faraday who had also built a burner on the same principle.

The Bunsen burner—a gas burner widely used for heating substances in scientific laboratories—consists of a metal tube with two openings at the bottom and a hose connecting the tube to a gas jet. A proper proportion of gas is mixed with air and when the burner is ignited it produces a hot flame without smoke.

### Kirchhoff—The Physicist

Kirchhoff was much younger than Bunsen when the two men met and started working together, but he was a clever scientist who had already done original work in mathematical physics and electricity. He

cated at the University in his native town, Königsberg, and was a lecturer at Berlin for a time. He next went to Breslau in 1850 as professor of physics. He was then only 26, and when he was 30, he was appointed professor of physics at Heidelberg where he was to work with Bunsen and make his greatest contributions to science.

Before the spectroscope and his development of spectroscopy with Bunsen, Kirchhoff's most important work had been with electricity and it was he who had shown by experiments that an electric discharge or current in a wire travels with the speed of light.

The invention of the spectroscope is linked with man's experiments with light, its spectrum and his efforts to discover what light really is.

Newton's early experiments with light and his theories as to its nature aroused the interest of scientists throughout the world.

### **Spectrum of Light**

As we all know, and as we have all seen for ourselves, when a beam of sunlight is made to pass through a prism of glass, the shaft of colorless light is at once turned into a pattern of colors—a "spectrum" from the Latin, meaning something seen.

Newton in his experiments simply made a small round hole in the shutters of his window and the spectrum he obtained usually on the wall of his room was made up of overlapping colored circles of red, yellow, green, blue and violet light.

One hundred years were to pass,

however, before William F. Fraunhofer, an English chemist improved the spectrum of light and made it easier to study. In 1802, he formed a simple experiment which allowed the light to pass through a narrow, vertical slit before it entered the prism. This made the spectrum "purer." Instead of a series of overlapping colored circles, there was now a long panel of light in which the colors did not overlap.

In time, scientists turned to the study of the sun's spectrum given by other sources of light. As early as the 18th century, chemists had shown that salts of various metals are in a colorless flame, they give a colored flame. The salts of sodium and potassium, for instance, gave a yellow and a lavender color.

In 1822, Sir John Herschel, a famous English astronomer, showed that the colored light from such sources as the sun, passing through a glass prism and that the spectrum was not a continuous band of colors but was made up of a series of bright lines with dark spaces in between.

For a long time Bunsen had analyzed substances in his laboratory by vaporizing them in this way. He found the method of great use in his researches.

One day in 1859, when he was using this method, Kirchhoff was watching him. Kirchhoff noticed that to tell the difference between flames that were almost the same color, Bunsen looked at them through pieces of colored glass.



**Robert von Bunsen**  
1811-1899

It struck Kirchhoff that it would be far simpler and more accurate for Bunsen to let the light of the flame pass through a prism, as Newton had done and then to observe the spectrum which was produced.

Bunsen was interested in the idea and they decided to work together to see if they could evolve a new and more accurate way of analyzing substances by using light rather than chemicals.

In their writings the two scientists described the instrument they had developed for their new field of study. This device, the spectrometer, was possibly one of the most important and powerful tools of research that has ever been developed.

#### Simple Instrument

The first spectroscope was a simple instrument. It consisted of a wooden box which housed a



**Gustav Kirchhoff**  
1824-1887

glass prism. At one end there was a small telescope and at the other a collimator or metal tube with a narrow vertical slit which was pointed at the flame of the burner in which substances were vaporized. The light of the flame passed through the collimator and was converted into a beam of parallel rays.

The light then passed to the prism and the spectrum was enlarged and examined by means of the telescope.

The two scientists soon found that each chemical element in the glowing gas gave a bright line or lines which were easily recognizable. The position of these bright spectral lines was definite, corresponding to definite wavelengths of light.

As we know today, light is radiated in waves of different lengths. Each color in the visible spectrum corresponds to a different wavelength. The short violet rays are "bent" by the prism to the great

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rtant and powerful tools of re-  
h that has ever been developed

### Simple Instrument

he first spectroscope was a sim  
instrument It consisted of a  
l wooden box which housed a

glass prism At one end there was  
a small telescope and at the other a  
'collimator' or metal tube with a  
narrow vertical slit which was point  
ed at the flame of the burner in  
which substances were vaporized  
The light of the flame passed  
through the collimator and was con  
verted into a beam of parallel rays

The light then passed to the prism  
and the spectrum was enlarged and  
examined by means of the telescope

The two scientists soon found that  
each chemical element in the glow  
ing gas gave a bright line or lines  
which were easily recognizable The  
position of these bright spectral lines  
was definite corresponding to defi  
nite wavelengths of light

As we know today, light is radi  
ated in waves of different  
Each color in the visible  
corresponds to a different  
length The short violet rays  
'bent' by the prism to the

and the long red waves to the least degree. The spectrum of each element contains lines which, by their color or position in the spectrum, differ from the spectra lines of other elements.

Bunsen and Kirchhoff were the first to make a systematic and scientific study of these spectra. They showed that it was quite a simple matter to analyze a mixture of more than one metallic salt or chemical and were quick to see that "spectrum analysis" was far more accurate and far more sensitive than any ordinary method of chemical analysis then known. The two scientists proved that it was possible to detect 3 millionths of a milligram of a sodium salt.

Bunsen used their new invention and methods purely for chemical analysis and the discovery of new elements, but Kirchhoff turned to the mystery of the sun and the stars. And for this research he has rightly been called the father of modern astrophysics.

### Fraunhofer Riddle

Kirchhoff solved one of the most puzzling mysteries of the day—the riddle of the "Fraunhofer lines."

In 1802, Wollaston had discovered seven faint black lines which crossed the spectrum of the sun and, in 1814, Joseph von Fraunhofer, a German optician, systematically plotted and studied the positions of 576 of these lines. But no one knew what they meant.

The problem of these strange lines is an interesting one. It was

found that the light given by incandescent solids, and by rarefied gases, gave "continuous" spectra. In other words, a solid—iron or carbon if at white heat—gave a spectrum in which all the colors of the rainbow are present. Noncondensable gases such as helium, hydrogen and sodium vapor

bright line or "emission" spectrum. Fraunhofer, himself, had shown that one of the dark lines in the sun's spectrum, occupied the same relative position as a certain yellow line of glowing sodium.

In 1859, the same year that Bunsen and Kirchhoff were examining the spectrum of sodium vapor, he found a small piece of incandescent which is calcium oxide behaved like a sodium flame and allowed the light from both sources to pass through the prism. Sodium, when vaporized, gives a bright spectrum and incandescent light spectrum containing all the colors.

Kirchhoff was startled to find, however, that the bright yellow lines of sodium were now changed to dark lines—which were the same as those which Fraunhofer had studied so carefully.

It was perhaps one of the most important experiments ever performed in a modern laboratory.

Kirchhoff reasoned that this must mean only one thing. Substances in the gaseous state blocked out or absorbed light of the same color

are wavelengths as that which themselves emitted. Fraunhofer's dark lines were actually gaps in the sun's spectrum. They merely took the form of thin lines as this is the nature of the narrow rectifying slit through which the sunlight

Similarly the bright lines in the line spectra are only imaged by the slit.

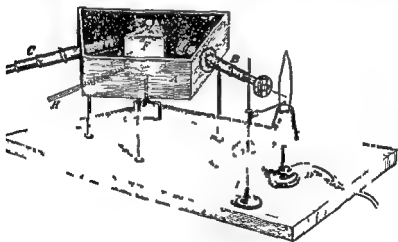
Kirchhoff soon found that the same thing happened to the bright lines of hydrogen and other glowing gases. The bright lines of all were reversed or reversed.

He reasoned that it should be the same matter then to note in the laboratory the bright line or lines distinguished any element

and match them with their dark line counterparts in the sun's spectrum. And this is what Kirchhoff did. Apart from sodium he thought it possible that other elements which are found on the earth would be found in the sun too.

In 1859 and the following years he proved that the sun contains among other elements iron, calcium, magnesium, copper, zinc, barium, chromium and nickel. Kirchhoff drew up a map of the sun's spectrum and this was published by the Berlin Academy in 1862.

As Bunsen said they had now found a startling new way of finding out of what the sun and the stars were made—with the same accu-



Box blackened inside holds two small telescopes B & C. A slitted plate at front of B. The fine loop of platinum holds C & F a hollow prism of carbon disulphide. The prism is on a vertical axis both the prism and the mirror G used with telescope to give an image of horizontal scale.



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found that the light given by incandescent solids and rarefied gases gave continuous spectra. In other words a solid, iron or carbon if at white heat, give a spectrum in which the colors of the rainbow are present. Rarefied gases such as hydrogen and sodium vapor, when heated or electrically excited, consist of one or more bright lines. Such a spectrum is known as a bright line or emission spectrum.

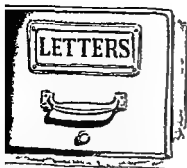
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## Id's Depth Record

your March issue you state that  
correct date - - -

ut Walsh and Piccard this winter  
all depth records when their  
scaph Trieste dropped approxi-  
ly seven miles in the Pacific Ocean  
bottom of the Marianas Trench  
descent was made after the  
h issue of SCIENCE DIGEST had  
to press, and unfortunately it was  
late for us to correct our item,  
was correct at press time

—EDITOR

## eology

an avid caver and member of  
National Speleological Society, let  
thank you for reprinting Russell  
ee's article "Hole in the-Ground  
y." It nicely summarizes my re-  
o the question I'm so frequently  
asked—What do you possibly get out  
crawling around underground?"

up the good work which I have  
fully followed since my introduc-  
to SCIENCE DIGEST two years ago  
JOHN WATKINS FOSTER, PRESIDENT  
U OF VIRGINIA GROTTOS  
NATIONAL SPELEOLOGICAL SOCIETY

## Left-Handed Violinists

Sirs

In the article "Astounding Facts  
About Left Handedness" by Nino Lo  
Bello (April 1960) it was stated that a  
"lefty can't pursue certain livelihoods  
such as violin playing." This is not so.  
The concertmaster of the local Tri-City  
Symphony is left-handed.

My father who teaches violin to  
grade school pupils, says that left-  
handed students have an advantage  
since fingering which is done with the  
left hand is more difficult than bow-  
ing, which is done with the right. Ad-  
vanced playing requires skill in both  
hands and is just as difficult for a  
right handed person as it is for a left  
handed person.

AMELIA C SMITH  
MOLINE ILLINOIS

## "Best There Is"

Sirs

I have been a steady reader of your  
fine magazine for the past 15 years. I  
would like to say it was the best there  
was 15 years ago, and it is the best  
there is today.

DENNIS MARTZ  
LIVINGSTON MONTANA

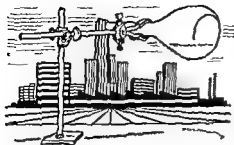
## Tastes in Movies

Sirs

I wonder if John E. Gibson's article  
"Your Taste in Movies Gives You  
Away" (March 1960) was just a  
bunch of boloney. I believe it is not  
the type of movie that most people take  
into consideration when making their  
likes and dislikes, but the "making" of  
the picture itself—the story, the action,  
the direction—the whole works. When  
I go to see a movie, I don't give my  
comments before I buy the ticket.

What then is my personality, Mr.  
Gibson?

MARS G C  
ANNAPOLIS MD



## INVENTIONS PATENTS PROCESSES

### **Telephone Company Tests Memory System**

Southwestern Bell Telephone Co will install telephone equipment with a memory on an experimental basis late this year.

When a caller dials a number and gets a busy signal a memory unit is activated. When the party hangs up both phones will ring. The equipment also may be used to record messages for a person during his absence.

### **Stripping Shovel Largest Mobile Land Machine**

A mammoth stripping shovel, the largest mobile land machine ever built, has been purchased by Peabody Coal Co of St. Louis. It will be built by the Bucyrus Erie Co of South Milwaukee. The huge shovel will be more than twice the size of any shovel now in operation.

The shovel will have a dipper capacity of 125 cubic yards. Its total weight will be about 14 million pounds and it will require over 12,000 horsepower to operate.

It will take about two years to build.

and erect the shovel. About 200 road cars will be required to transport component parts to the mine site.

The shovel boom will tower 116 ft in the air—as high as the deck of the Golden Gate Bridge. In 50 seconds the machine will pick up 173 tons of material, dump it 464 feet away, swing back for the next bite. It removed by this machine in one day could fill all the cars in a train going from Pittsburgh to Chicago.

The huge shovel will be controlled by a single operator located in a conditioned cab five stories up. A passenger elevator will provide access to the cab.

The entire machine will be supported by hydraulic cylinders, one at each of the four crawler tracks. Each track operates independently and automatically adjusted to keep the machine in level position at all times.

On the job the shovel will dig and cover more than twice its own weight in coal. It will be used to remove earth which covers the coal seams in strip mines.

### **Electronics To Speed Patent-Search Process**

Streamlined patent searching using electronic computer techniques is being tested at the U. S. Patent Office in Washington, D. C. Patent Office officials say it may accomplish in half an hour a job that formerly a skilled researcher up to a full day.

The new system relies on rapid calculation by a general purpose electronic computer that can process data turned out by a punched card machine. The system is manufactured by the Computer Division of Bendix Aviation Corp.

At the present time the computer is being tested on a huge mass of patent

covering chemical compounds that the basis for many commonly plastics

cording to Patent Commissioner R C Watson the Patent Office long felt that development of an automated searching system would provide industry and the public with a viable solution to keeping up with the rapidly growing number of patents issued each year. He pointed out the Patent Office now issues more than 1 000 patents each week.

### **Highway Train" Controlled by Army**

A highway train in which 12 or more powered cars are coupled together under the control of a single driver is being investigated at the Stevens Institute of Technology under a contract with the Army Transportation Research Command.

Designed for long hauls the train is used for travel on highways and other roads carrying up to 100 tons of cargo at maximum speeds of 25 miles per hour. A driver in the lead cab would control speed and steering for all cars and the power in one of the units would be disabled unit could either be released or retained as part of the train.

Once at its destination the train can be separated and individual vehicles

for surface and more efficient highway usage.

### **Free Food Item— Frozen Concentrated Milk**

University of Wisconsin dairy scientists have developed a method of producing frozen concentrated milk which they indicate has taste appeal.

The processing method duplicates many of the steps for sterilization of concentrated milk. Raw milk is pasteurized homogenized and concentrated. It is then packaged in cans and undergoes another heat treatment. After this the canned concentrate is cooled and frozen. When stored at 10° F, the milk retains its flavor for at least 3 months the university scientists said.

### **Detailed Aerial Photos Taken at Night**

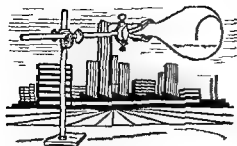
A detailed infrared photo of Manhattan was taken at 11 P M January 9 1958 from an altitude of 4 000 feet. The system by which the photo was taken has recently been declassified by the Office of Security Review Dept of Defense.

Manufacturer of the system called Reconofax is HRB Singer Inc a subsidiary of The Singer Manufacturing Co.

Reconofax makes use of a scanning camera with an improved detector which is highly sensitive to infrared radiation. Radiation—or heat—differences between objects are recorded on film by a recording lamp. By utilizing a radio relay system the picture can also be developed almost simultaneously at a ground station.

Since all objects on the ground including military targets emit infrared radiations infrared provides an ideal means of producing night photographs. An advantage of infrared is its ability to detect radiation which is not visible thus providing a possible means of camouflage detection.

In the Manhattan picture areas of considerable industrial activity, such as the power plants scattered throughout the city are easily distinguished from areas of moderate activity residential and commercial—and



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- 65

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slight activity such as Central Park.

Reconofax's ability to resolve relatively small changes in temperature is seen in the clear definition of the roads and paths in Central Park.

In the Hudson River the calm water beside a ship is easily distinguished from the agitated water in its wake. A submarine's wake might thus be made visible.

Reconofax may also have a number of nonmilitary applications. For example it can be used in hazardous areas for obtaining weather, oceanographic and topographic data. Water temperature is said to be correlated with water depth. The contours of a shore line can thus be determined from the air.

Another application might be in medical electronics. Since infections cause inflammation or heating of the skin, the film will show bright spots where infection exists.

### 'Side Man'

#### **Electronic Rhythm Maker**

If your combo is short a drummer try 'Side Man'.

'Side Man' is an electronic rhythm producing device that can be operated without the use of tapes or records. The device put out by the Wurlitzer Co. can produce rhythm patterns for the waltz, cha-cha, fox trot, beguine, tango, samba or rumba.

Find it here at the Science Center.

Used as accompaniment to a piano or other instruments, the 'Side Man' automatically produces the preselected rhythm. But for the musician who prefers to create his own rhythms, there is a push button panel so that 'Side Man' can be manipulated to the user's liking.

### **Make Colored Motion Picture From Black and White Film**

Technicolor Corp. of Hollywood has been assigned the patent right method of making colored motion picture film from a black and white original.

The method involves projecting an image of the original on a sheet of material suitable for coloring. The image is then appropriately colored and photographed on color film with the chrome original in contact with a sensitive film. The resulting picture film thus contains both color and detail.

### **Apartment House Guarded by Television**

Tenants in a New York luxury apartment building are being observed by closed circuit television screens. They ride an automatic elevator to their floors.

A small television camera is mounted on top of the car, relays a color image of the car and its occupants to a lobby screen that is watched by a doorman. The system was installed to offer tenants greater protection.

A television console in the lobby has two screens. One shows the interior of the car, the other monitors the entrance in the basement. The doorman can talk over a two-way radio with persons at both sites.

The security system is one of its kind, according to John J. Sugar, president of Bell Telephone Inc., the designer.

### **Bird Feeder Feeds Little Birds Only**

A patent was issued on a bird feeder that feeds little birds but not big ones. It shuts its door in the face of anything as bulky as a bluejay.

inventor is Wilhelm E. Poulsen. The feeder can be adjusted to serve weighing 2 ounces or less such as blue jays, nuthatches, woodpeckers, and house wrens.

The feeder has glass sides and rests on a base about 12 by 16 inches. The wings in the wind so that the bird is always sheltered. In front of the doorway is a perch that does not swing under a light bird which can see and help itself to seeds from a

perch. The weight of a big bird, however, the perch dips and pulls down on the



### Fire Starter Comes in Tube

Each summer almost here backyard barbecues are beginning to make their appearance again. National Distributors Inc. has come up with a chemical fire starter called the Flame that comes in a roll up

like the most fire starters are liquids. The Flame is semisolid. It looks like a bright red jelly but will not stick to the sides. To start a fire with Miracle, you squeeze out an amount the size of a golf ball under the cap or wood and light it. This will burn for about ten minutes. The lack of oxygen can keep Miracle Flame from burning the manure, say. It will even float and burn on water. This makes it useful for hunters, fishermen, and campers. It rainsoaked ground or wood will not top it from burning.

### Slip Proof Bathtub

A new product provides a simple yet effective method of slip-proofing a bathtub. The product called Don't Slip consists of 12 adhesive strips about an inch wide and of different lengths so that they may be laid out in a decorative pattern.

The surface of the strips is a synthetic rubber. A small roller is provided to eliminate air bubbles after the strips are placed in the tub.

### Thermometer Tie Clasp

A tie clasp with a built in circular thermometer is being offered by Zinn Originals. The thermometer has an easy to read dial and is calibrated from minus 20 to 120° F. It is sensitive to within one degree. The same thermometer is also available in cuff links.

### Magnetic Storm Door

An aluminum storm screen door that closes itself magnetically has been announced by Weather Seal Inc. The door uses a Koroseal vinyl plastic magnetic strip recently developed by H. F. Goodrich.

According to Goodrich this application is the first use of the flexible magnet in the home field. It was developed for and is widely used as an airtight seal for refrigerators and freezers. Permanency of the plastic magnet is claimed to be superior to that of most conventional types.

### ADDRESSES

S de Men Wurlitzer Co. De Kalb Ill.  
Fire Starter National Distributors Inc. 204  
Market, Wichita Kan. Slip-Proof Bathtub  
Don't Slip Inc. 340 W. Lincoln Ave.  
Vernon, N. Y. Thermometer Tie Clasp  
Originals 321A Greenwich St. New York  
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### ADDRESSES

Side Man, Wurlitzer Co., De Kalb, Ill.

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## SCIENCE DIGEST

January through June, 1960

*Titles listed in italics are usually less than a full page in length. BC indicates Back Cover, IBC, Inside Back Cover. IFC Inside Front Cover*

## AGRICULTURE AND BOTANY

- Cheap Protein from Grass* Jan 91  
*Chemical Regulates Plant Growth* Apr 21  
*Orchid with a Flavor* Jan 12

## ALLERGY

- Allergy to Husband* Jan 50  
*Repeated Nose Bleeding May Tip off Allergy* May 32

## ANIMALS

- Abalone: Mighty Mollusk* Mar 80  
*Bird Mortality Boosted by DDT* Mar 18  
*Dogs Bite Worse than Bark* May 77  
*Kain as Bear* Apr 31  
*Language in Animals* Jun IBC  
*Life with Lizards* Jan 20  
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BASIC FACT of life in the atomic era is that you cannot use the fissioning atom for war or without producing vast quantities of lethal radioactive wastes over the past 15 years while one of the Atomic Energy Commission has been conducting bomb tests adding fallout globally another has been transporting precisely same kind of radioactive material to isolated areas and warily burying it in underground steel lined reinforced concrete tanks

the only real difference between radioactive and wastes at the former is a high dose rate by an uncontrolled nuclear reaction with subsequent severe deterioration by the variables of wind rain whereas radioactive wastes are the by product of a carefully controlled nuclear reaction and their waste disposal is up to man

Not all of the atomic wastes are equal some of the less radioactive material is released into rivers or pumped into the sea by the AEC and licensees. It is this form of disposal that has provoked much of the recent controversy.

Although the controversy over disposal of radioactive wastes has been going on for some time it

was heightened in the spring of 1959 when the National Academy of Sciences released a report "Radioactive Waste Disposal into Atlantic and Gulf Coastal Waters" prepared at the AEC's request suggesting 28 tentative sites for offshore dumping of low level radioactive wastes. The anguished howls from chambers of commerce citizens groups state conservation departments fishing and recreation interests and many congressmen are still ringing in the AEC's ears.

The essence of the AEC's disposal problem lies in the nature of the waste itself compared with all other industrial pollutants radioactive waste is millions of times more toxic undetectable by human senses and absolutely ineradicable except by a process of natural decay that may take centuries.

Clearly this is the most hazardous and treacherous material man has ever tried to deal with. The danger of accidents was dramatically illustrated last November 20 by a minor explosion at the Oak Ridge National Laboratory in a room where highly radioactive wastes are processed to recover plutonium.

The explosion destroyed \$10,000 worth of equipment and scattered one fiftieth of an

# THE ATOM'S POISONOUS GARBAGE

by Walter Schneir

Condensed from *The Reporter*

Compared with all other pollutants radioactive waste is millions of times more toxic

plutonium over a few acres. For the following three months, cleanup crews tracked down the minute quantity of plutonium, they painted buildings, tarred roofs, replaced asphalt roadways, removed and resodded grass, and destroyed several trucks.

Physicians examined 250 employees and found that nine had absorbed some plutonium internally. By February 15 the job was nearly but not altogether finished. Total cost to decontaminate a \$10,000 explosion—between \$250,000 and \$350,000.

This three-month cleanup task was made necessary by a little more than half a curie of plutonium waste. A curie is the basic unit of radioactivity. Physically it is a very tiny fraction of an ounce of material, from the standpoint of human health it can be an enormous amount of radioactivity.

In the pre atomic bomb world of 1940, only a few thousand curies of radioactive material (mostly radium) were available in the entire world. Today our weapon manufacturing program (not counting testing), plus our peacetime reactor program, is producing billions of curies of liquid, solid, and gaseous wastes every year.

The huge steel tanks interred at five different locations (primarily at Hanford, Washington) in the United States contain more than 65 million gallons of high level radioactive waste. Within the boiling hot cal-

drons is enough radioactive material to cause severe pollution of all the land and water area of the United States. The tanks themselves may last for another ten to 50 years, but their contents will be deadly to life for many centuries.

**T**HE WASTES can probably be successfully transferred to tanks, but no one regards tank storage as a long term answer to the problem. The hope is that permanent means of disposal will eventually be developed. One suggestion is to pump high level wastes into deep, mined-out salt deposits.

Possible hazards from this technique, however, include the contamination of waters that surface streams and the formation of radioactive geysers as a result of the heat generated by the wastes.

Two approaches are at present available for the disposal of radioactive wastes: concentrate and inter or dilute and disperse. The wastes will continue to concentrate and retain the hottest wastes. Only low level wastes are released into the environment. For this reason, many people believe that low level wastes constitute the greatest present hazard.

Low level wastes generally contain from a few millionths to a few thousandths of a curie per gallon. Some, loosely classified as "intermediate," may be as "hot" as a few curies per gallon.

The low level wastes are produced in enormous quantities accord-

e AEC, any plan to concentrate contain any considerable fraction of them would be impracticable extremely costly

the Columbia, the Mohawk, and other rivers are currently being used to dispose of low level wastes, within a few months the river will be used for such disposal

Other low level liquid wastes are poured directly into the ground and solidified liquids are sometimes placed in concrete lined steel barrels and dumped at which time gaseous wastes are released to the atmosphere



The disposal of these wastes is fully guided by maximum permissible levels for human exposure

... a question is presently asked "Is the so called maximum permissible level" of radiation a completely safe level? The answer is "No" It is impossible to have a completely safe level of radiation, "permissible" levels must therefore be chosen in an essentially arbitrary fashion by a balance of medical, economic, and scientific factors

The trouble with the dilute-and-disperse theory is that low level wastes released into the water do not dilute in any predictable

able way For example, many organisms concentrate radioactive elements in their bodies by factors many times the quantity of radioactivity in the water

A few years ago, scientist Louis A. Krumholz conducted a three year study for the AEC and TVA to determine if partially purified liquid waste discharged by Oak Ridge into White Oak Lake had any effects on life in the lake

Doctor Krumholz reported that the fish in the lake grew more slowly and died younger than was normal for the species Large quantities of strontium 90 had been absorbed into the bone structure of bluegills and black crappies in concentrations 20 000 to 30 000 times those found in the lake itself

One species the white crappie, relatively common in the lake when the study began had died out, another, the redhorse, had nearly disappeared—only 50 were found all three or four years old

Incidents such as this have been cited in the current controversy over ocean and offshore dumping as reasons for an extreme degree of caution The *Wall Street Journal* recently quoted Dr Paul C. Aebbersold, an AEC official in rebuttal "Underwater disposal is absolutely safe when it's properly executed"

Reporting an international conference on the subject of radioactive wastes, the *London Times* science correspondent John H. Garvey wrote "It is not within the reference of the AEC's resolutions on"

if it had been, it is quite likely that a resolution would have been passed today urging that radioactive waste disposal at sea should be banned."

Huge gaps remain in our knowledge of the seas. We still are very far from knowing all there is to learn about the ocean's currents or the mixing rates of the deepest layers of the water with the surface. Not long ago many oceanographers felt that the deepest waters might not mix with surface water for 2,000 years—now they are not sure.

We do know that the ocean like rivers and lakes is not a simple dilution tank. Microscopic organisms, plankton and shellfish concentrate radioactivity by many thousands or even millions of times the level in the surrounding water. Fish range freely between deep ocean and continental shelf. Shrimp, squid and other organisms help spread radioactive elements from the depths to the surface.

The natural radioactivity of the oceans is much less than that of the land. Soon man will have the power to increase this radioactivity just about indefinitely. What would be the effects of such a change on the life in the sea and on human beings who depend on the sea for billions of pounds of protein each year? Frankly, no one knows.

WITH THIS UNCERTAINTY as background, U.S. Bureau of Standards Handbook 58, issued in 1954, gives this advice regarding radioactive wastes: "Disposal shall be in regions, where water

depths exceed 1,000 fathoms.

"In the case of sea the act is final if disposal is carried out under conditions that later appear to have been advised, or dangerous, there is a way of correcting the situation."

of Sciences William ... panel is of the opinion that the Atlantic and Gulf of Mexico ...



Of the 28 tentative dumpsites suggested by the NAS, some are as little as three miles from shore in water 40 or 50 feet deep. At Cod, where commercial fishing and the bathing beaches are vital to the local economy, a protest committee was formed. Its research closed that unknown to local residents and contrary to the warning in Handbook 58, offshore dumping had been going on for years. Crossroads Marine Disposal Corporation of Boston had been dumping radioactive wastes in 50 fathoms of water in Massachusetts Bay in 1946 and on an AEC license in 1952.

The AEC has since amended its license of this company to prohibit dumping in less

fathoms Texas Representative Clark W. Thompson has proposed a bill calling for disposal of wastes at least 200 miles from shore in water over 1 000 fathoms deep, in leakproof containers.

The last point is important inasmuch as the AEC does not require barrels be so constructed as not to leak open at 1 000 fathoms. Nor does anyone know how many barrels dumped into the sea spill their radioactive contents on the way down. Those which reach the ocean safely are expected to corrode in 10 years.

In any conflict between cost and safety the AEC finds itself in an embarrassing position. It controls and encourages operations which produce radioactive waste then regulates itself and its licensees to insure that the waste does not harm the public. A case in point is the pollution of the Animas River in Colorado and New Mexico where the water used by 20 000 people was found by the U. S. Health Service to contain radium in far in excess of maximum permissible levels.

The radium in the Animas River comes from a uranium refinery run by the Vanadium Corporation of America. For more than ten years this company had been pouring wastes into the river without regulation. Colorado and New Mexico demanded that the AEC supervise the process. The AEC insists it had no regulatory authority until a score or more of uranium mills were built in 1957.

TO MANY of the foregoing criticisms AEC spokesmen reply that the critics are misinformed or just don't understand. These spokesmen note that the AEC has no present plans for ocean dumping of high level wastes which are the only wastes that could substantially alter the radioactivity of the oceans.

When the Atomic Energy Act of 1954 was passed the very existence of radioactive waste was largely unknown to the public. This ignorance prevailed until 1956 or later.

An apparent slowing down of reactor development may provide an opportunity for Congress to reconsider the path we chose to take in 1954. Most of the present reactors in the United States are owned by the military or the AEC—the era of commercial power reactors is just beginning. We can still take a rational approach carefully balancing social gains against social losses instead of treating atomic power almost mystically as the inevitable wave of the future.

On the side of gains would certainly be the AEC's isotope program which provides invaluable research aids to medicine, industry, and agriculture. But is the production of atomic power to be counted a gain when fossil fuels are far cheaper and still abundant? Is the construction of more and more atomic plants with their potential for mass destruction a gain? Perhaps the answer is "Yes." But shouldn't we at least ask the question?

For example, some estimates predict 300 fission powered

1975, dumping over a million curies of waste into the sea each year. Nuclear submarines and icebreakers have great and obvious advantages but is it worthwhile to build merchant and passenger ships with atomic reactors? If the *Andrea Doria* had been nuclear powered, millions of curies of radioactivity would have been released in the sea close to Nantucket and very likely all the passengers would have been killed. To judge the effects on beaches and fish we need only recall what our Bikini tests did to Japanese tuna.

Certainly any careful weighing of the pros and cons of nuclear power will have to consider the recommendations on Somatic Radiation Dose for the General Population released by the National Committee on Radiation Protection and Measurements. Here is one of the report's conclusions:

We believe that the population permissible somatic dose from man-made radiations excluding medical and dental sources should not be larger than that due to natural background radiation without a careful examination of the reasons for and the expected benefits to society from a larger dose.

The burden of this conclusion is that the maximum permissible dose for fallout atomic waste and all other man-made radiation excluding medical X-rays should be no more than one tenth of a roentgen annually or a total of three roentgens for 30 years. Whether it will be possible to develop nuclear power on a large

scale and still meet such a goal is a question yet to be faced.

ONE MAJOR make all our radioactive wastes academic. of the world's leading physicists believe that man's ultimate power will be atomic fusion rather than fission. There is a strong possibility that the power of a thermonuclear reaction (such as is used in the hydrogen bomb) will be tamed and harnessed.

Happily fusion power would produce no atomic wastes and for practical purposes would be inexhaustible.

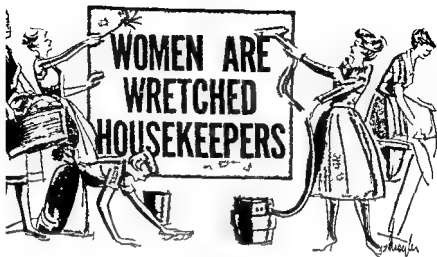
Using the facts that are available to us today we might do well to ask a few last questions before it is irretrievably too late to set full sail on an uncharted course.

Just how essential is a large fission reactor program to electricity to meet our power needs in the next few decades?

When do we actually expect to be faced with shortages of fossil fuels?

Do we need some separate regulatory agency, other than the AEC, to protect the public from radiation hazards of atomic waste and fallout?

Our answers to these and other questions will be better reasoned if we can free ourselves from the mistaken notion that a complete conversion to fission power is inevitable. It is not too late at this point to reconsider old decisions and make new ones. For the moment at least a choice is available.



By Murray T. Pringle

all started when Enghausen  
 a *Tribune* story about the long  
 week of today's young mother  
 Enghausen had his own opinions  
 it that and he promptly ex-  
 them in a letter to the  
 or Among other things he stated  
 any woman who puts in that  
 hours as awfully slow a poor  
 geteer of time or just plain in-  
 tent The 36 year old bachelor  
 duded his letter by offering to  
 over the reins of my household  
 show the housewife how it  
 ld be done  
 cores of irate housewives wrote  
 cepting the challenge just dir-  
 Enghausen to prove it The  
 ur selected t of Mrs

Robert Dalton and arranged for him  
 to assume command for three days

If Minneapolis housewives had  
 expected their critic to chicken out  
 they were disappointed Armed with  
 nothing but his theories and more  
 courage than the law allows he  
 moved into the Dalton home The  
 Daltons incidentally had been the  
 subject of the original news story  
 that had inspired Enghausen's letter

I want you to understand he  
 told Mr and Mrs Dalton that you  
 are to take it easy From now on  
 the housework and children are my  
 responsibility

Mrs Dalton smiled and sat back  
 with an interested show in  
 pression on her face At  
 the three day period  
 was no longer in a  
 sour frame of

I never saw  
 said Within  
 thoroughly



our house, and he seemed to know just where everything was—the soup in the basement and the pliers on the rear of the refrigerator top.”

Mrs. Dalton was unstinting in her praise. “He was certainly methodical. The only thing he forgot was to wind his watch. He certainly fit beautifully into our family. What a marvelous valet he would make! In cooking he did better than I. As for cleaning, I am more thorough, but perhaps that is unnecessary. In summing up, she described the bachelor housekeeper’s stay as wonderful, adding, “Even the kids were sorry to see him go.”

Here is a partial rundown on what Enghausen did the first day:

Cleaned the first floor

Washed three loads of clothes and hung them outdoors to dry

Ironed all the laundry, including underwear and sheets

Fixed a soup and sandwich lunch and a big supper which he served in the backyard

Baked two cakes, neither from a commercial mix

Prepared two salads for the next day

Bathed Marty, 6, Mary, 3, and Robbie, 2, simultaneously. (Timmie, 7, escaped when he heard water running.)

Washed woodwork.

**E**XHAUSTED, ladies? Enghausen wasn’t. He proved it by tackling more chores.

Undressed the children for their nap, redressing them when they awakened.

Borrowed soda for the cake baked from a neighbor whom he described thusly: “She looked though she thought she had humored me.”

Disciplined the children. Scrubbed the kitchen floor. “I don’t believe because ‘I don’t believe putting things off.’ All this was accomplished during his first day on the job.”



The children loved him. Upon departure, seven-year-old Timmy gave him a going-away gift of pennies. Three-year-old Mary climbed onto his lap and told him, “I love you. And two years ago.”

Interviewed at the end of the three-day trial, Enghausen chuckled victoriously. “I still wish, he said, “that teaching 115 students was as easy as handling four children in a house.”

Enghausen figured his work totaled 20 hours for the three days. Asked to what he attributed his remarkable efficiency, the bespectacled bachelor pointed out that he had kept house for himself for many years and did housework to save money while a college senior.

“I still maintain,” he concluded, “that housework is not the most noble chore that women claim it to be. Those who claim so are inefficient.”

Recent scientific studies have confirmed up Enghausen's conclusions on the motion study which recorded and analyzed every movement made. A group of housewives concluded that most of the energy expended in housework is superfluous. The results of this study, according to the *Medical Times*, points to a causative factor in diseases such as arthritis which often begins in the joints.

ill adapted kitchens lack of improved work methods and poor arrangement of equipment were blamed for American housewives' extravagant expenditure of energy. An average of 500 steps a dozen starts and stops and 40 to 50 reaching movements were involved in

research at Wayne University in Detroit revealed that many accepted procedures followed by most housewives were actually wrong. The studies disclosed that women were working more than twice as hard as they should because

- 1 They don't arrange household equipment properly
- 2 They don't plan working methods carefully
- 3 They squander energy through wasted motion and unneeded steps
- 4 They are victims of habit and tradition

Now what about you? Do you want to waste your time and energy? Would you rather enjoy untired leisure hours with your family? There are a number of work easing,

time saving rules of household behavior which scientific studies have shown will slash household drudgery.

**F**IRST avoid reaching up and stooping. In nine homes out of ten pots and pans are stored in kitchen cabinets at floor level. The Wayne University tests revealed that almost 20 times more energy is expended by stooping to pick up an object near floor level than in taking it from an upright, flat footed position.

Avoid this needless drain on energy by rearranging supplies and equipment so they can be used without stoop, squat and stretch.

Here's a pleasant bit of advice: *Sit whenever possible.* Amazingly, the average American housewife insists sitting down on the job. Yet it has been found that exactly half the energy is needed to do a job sitting down as standing. So if the job—be it ironing, dish washing, potato peeling, batter mixing—can be done sitting down, sit! But sit properly, well back on the chair, trunk in a straight line, feet flat on the floor.

Are you ambidexterous? You should be—or at least try to be. According to Dr. Lillian Gilbreth, one of the foremost authorities on bio-mechanics, considerable time and energy can be saved by learning to use both hands effectively. Whether or not you realize it, one hand does more work than two. Put those "extra" hands to work, too.

Develop smooth movements. Rhythm.

exclusive property of the ballet dancer or golfer. Rhythm is an important attribute in any type of repetitive work.

Says Dr. Gilbreth: "Anyone who is motion minded subconsciously follows a pattern. Each time she repeats a job her hands move in the same curve and with the same rhythm. A ballet dancer, golfer, in fact any expert does his job with grace, rhythm and economy of motion."

Do you abhor bed making? Well, it can't be avoided but here too you may be making unnecessary work for yourself. Lots of women do. A study of bed making at the University of Vermont Agricultural Experiment Station disclosed that women trot endlessly back and forth while performing this chore. One lady traveled 262 feet, another 188 feet.

**T**HERE IS a right (easy) and a wrong (tiring) method of bed making. Compare the following with your present system.

Place everything you'll need on a chair at the right side of the bed—sheets, blankets, pillows, bedspread. Stand at the bedside and throw the bottom sheet across the mattress. Follow with top sheet, blanket and bedspread. (So far, you haven't moved a step.) Now start walking around the bed, tucking in the bottom sheet first, then the top sheet and blankets. Smooth the spread as you go. The entire operation shouldn't take more than one or at most two round trips. See how easy it is?

Proper storage is important to an

efficiently run household. We and wherever possible keep equipment and food at the first usage. If an item is with heat, store it on or near stove. This would include as pot holders, lids of pots plus seasoning, can openers and goods.



Marshal your equipment by tackling any job. One housewife volunteered herself and her making methods for scientific really did things the hard way was noted as this lady vacated her living room that she kept cleaner attachments scattered various places about the house. actual count she made a total of 15 trips—wholly unnecessary, round up needed parts each time, cleaned the room.

She was advised to use a tray to carry these attachments, eliminating the need to return constantly to a drawer or closet. the housewife acted upon the advice, her cleaning time was shut half.

On the subject of biomechanics, Dr. Gilbreth suggests 'Take fullest advantage of momentum, gravity in your work.' The doctor goes on to explain that in doing such as ironing, the weight of the tool should do part of the work, the hand merely guiding it. Dr. Gilbreth further suggests placing

ider heavy furniture that must  
ntly be moved  
lly, beware of psychological  
Dr William Sherman writ  
*The Journal of The Student*  
*Association* offers the fol  
tips for combating it  
id clutter as much as possible  
completion of a chore put  
ind clean up  
id glare Metal surfaces and  
re insidious and subtle sources  
re which rebounds into the  
id tiring colors White is espe  
tiring So to a somewhat

lesser degree, are purple & brown  
orange as well as the harsher shades  
of blue Most restful colors in the  
spectrum are medium shades of  
green and yellow

**W**ELL THERE IT IS ladies Why  
not try putting some or all of  
the above into effect at your house?  
It's to your benefit Besides you  
don't want a mere bachelor like  
Maurice Enghausen showing you  
how it should be done Just remem  
ber that many American housewives  
really are poor housekeepers Don't  
be one of them!

## Glassy Shapes Are Not from Space?

RES—MYSTERIOUS glassy objects  
believed to have come from  
pace—are probably native to the  
The glistening shapes which re  
: buttons spheres bowls and  
appear to have no relationship  
geological formations in which  
re found  
fence to back up this conclusion  
their origin was presented by an  
can chemist and a German phys

imical analysis of the tektites  
they contain only 5 to 10 percent  
ich nickel as do glassy materials  
to come from meteors accord  
Dr William D Ehmann of the  
rsity of Kentucky  
e low nickel content and nickel  
ratio found for tektites do not  
h elm nate the possibility of  
formation by meteorite impact  
Dr Ehmann However on the  
of comparison to known impact  
their formation by meteor im  
either terrestrial or extraterres  
years to be unlikely

Measurement of the ages of tektites  
from various parts of the world by a  
radioactive technique has led Dr J  
Zahringer research assistant at the  
Max Planck Institute in Heidelberg  
Germany to much the same conclusion  
he said

One theory has been that tektites  
originated as the result of the impact of  
meteors with the moon Dr Zahringer  
indicated But measurements made by  
a potassium argon dating system  
show that all samples of tektites from  
the South China Australia region are  
about 600 000 years old those from  
Czechoslovakia are 9 million years old  
and those from Texas and Georgia are  
30 million years old

It is an interesting observation that  
these ages all agree with the ages of the  
geologic formations in which the t  
tites occur the German scientist  
This suggests the hypothesis that  
tektites are of terrestrial  
they fell to earth shortly after  
were formed or else were  
earth by huge impacts of

*Tunnel Diodes Promise To Perform Many Jobs Better, Faster*

## pinhead marvel of electronics

by Stanley W. Penn

*Condensed from Wall Street Journal*

THE TINY TRANSISTOR current king of the electronics world eventually may be deposed by an even smaller device known as a tunnel diode.

The newcomer performs some of the same jobs as a transistor and does many of them better, faster and cheaper. The tunnel diode will have a wide range of applications in defense, in industry and in the home. It is not likely to replace the transistor in all applications, but it will supplant the older device in many areas and supplement it in still others, scientists believe. Furthermore, because the tunnel diode can be used in a number of places where the transistor cannot, the new device also poses an additional threat to the old vacuum tube.

The new development promises among other things faster, cheaper electronic business machines, improved television reception in rural areas and better and more compact communications systems for space vehicles.

All major U. S. makers of transistors and other semiconductors are materials electrically less efficiently than materials classified as semiconductors. Semiconductors can amplify or control electrical im-

to be swift. Indeed, little two years ago the tunnel diode was unknown in this country. It was discussed in the U. S. in early 1958 in *Physical Review*, a technical journal, by 34-year-old Leo Esaki, a Japanese physicist.

At first Dr. Esaki's article caused a stir. Then a few electronics companies began to grasp the tremendous potential of his device. The tunnel diode, which is only about the size of a pinhead, is now being used by General Electric Co. to be up to 100 times faster than the transistor in some uses. Also, it can be as small as one-tenth of the size of a transistor and does comparable functions at as little as 1 percent of the cost.

It is at once simpler and thus promises to be easier and cheaper to mass produce. Unlike the transistor, the tunnel diode can perform efficiently at extreme temperatures in communications devices at high frequencies.

Despite its many advantages, there are some drawbacks to

is diode. It is essentially a low frequency device and performs so efficiently in electronic systems requiring a great deal of power such as television transmitters or in products operating at low frequencies such as AM and phonographs. Here the diode is likely to be superior materially and functionally to the transistor. The differences in characteristics of the two devices indicate both amplify signal and/or control electrical current. Both can consist of the semiconductor metallic elements silicon

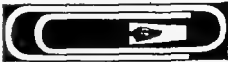
The new Resdel amplifier weighs one and a half ounces, compared with 25 ounces for the comparable tube amplifier. The diode amplifier occupies 1.9 cubic inches and uses only 50 millionths of one watt of power, whereas the tube amplifier occupies 18 cubic inches and consumes five watts. By conserving space and power, the diode should find many uses in military and space equipment where such features are vital.

Sony Corp., the big Japanese electronics company, plans immediate marketing of its tunnel diodes in the United States. Dr. Esaki was a researcher for Sony when he developed his device. Sony says it has applied for a U.S. patent on the tunnel diode.

These differences between the transistor and the diode arise mainly in the amount and nature of foreign matter that is introduced into the semiconductor material. Fifty to 100 times as much foreign substance as into the transistor. These impurities form a very thin barrier in the tunnel device through which electrons 'tunnel' at the speed of

Industry executives agree the tunnel diode will find its way into data processing systems and other equipment much faster than the transistor which was first successfully put to use together by Bell Telephone Laboratories technicians in 1948 but was not offered in an international Business Machines Corp. commercial computer until 1955. →

### the tunnel diode



A tunnel diode can fit comfortably

in one of the first applications of the tunnel diode in the U.S., Resdel Engineering Corp. of Pasadena, California, is using GE's version of the device in a missile to amplify signal the missile sends out while in flight. Resdel expects the system actually to cost about one-fourth as much as the conventional two-tube system it replaces.

Scientists had to learn a new technology in developing the transistor but this knowledge is being put to good use with the new diode.

Economics of course is another important consideration. Dr W R Sittner, division manager of Sperry Semiconductor division of Sperry Rand Corp., says flatly that tunnel diodes will lead to the manufacture of smaller, less costly computers. Major initial applications he suggests probably will be in high speed computers for the military; then, as volume increases and costs are reduced, it probably will become a strong competitor to transistors for computing functions and logic circuitry in electronic business machines.

**A**LREADY TUNNEL DIODE prices have dropped sharply. When GE first made samples available last September, they sold for \$75 each. New ones came off a G F pilot production line recently priced as low as \$10. And it is predicted the tunnel diode eventually will be cheaper than its transistor counterpart. The average price of transistors used in computers is \$2 each for those made of germanium and \$10 for those of silicon, which withstand higher temperatures than germanium. Simpler transistors used in radios and other entertainment products sell for much less.

Doctor Alan W. Glover, vice president and general manager of the Semiconductor and Materials division of Radio Corp. of America, asserts that tunnel diodes will be ex-

The human mind is often so wild and ill regulated in career of invention that it is first incredible that any discovery should be made and it has been made, it appears credible that it should have long escaped men's research.

—Francis—

cellent for earth satellites where the size of equipment and power supply is critical. He explains that since the devices operate on little power, the weight and size of battery supplies can be cut drastically.

Tunnel diodes also permit more compact packing of circuits because they give off less heat. This means not as much air is needed between the diodes to carry off heat as is required with a transistor. The transistor in turn was a notable improvement over vacuum tubes which gave off even more heat.

The diodes promise better TV reception in suburban and rural areas. The diodes, mounted directly on TV antennae and powered simply by a flashlight battery, can be used to amplify a TV signal without increasing noise and static to the extent that many conventional amplifiers do, according to William Siebert of International Telephone and Telegraph Corp.

Bell Laboratories researchers Marion E. Hines and William Anderson have developed a tunnel diode amplifier that increases the strength of radio signals in the microwave range over 1,000 megacycles. The transistor cannot be

here because of the high frequencies and the diode is significantly smaller, cheaper and lighter than vacuum tubes which are used usually.

particular importance is the fact that tunnel diodes are believed to perform better than transistors under extreme temperatures. A diode made of germanium will perform at up to 650° F. compared with a limit of 400° F. for a silicon transistor. The tunnel diode works well at the temperature of liquid helium which is a few degrees above absolute zero—460° F. A silicon transistor comparison ranges down only to 100° F.

Scientists believe the tunnel diode is well suited in the growing field of cryogenics—the study and use of extremely cold temperatures—making possible the design of equipment now impractical. (See *Cold About Cryogenics* p. 35—)

For example, cryotrons electronic switching devices that incorporate temperatures close to absolute zero in their operations even could be used as fast acting computer components. They need no amplifying device to work them—a job the tunnel diode could fill.

In one unusual experiment the tunnel diode was used to measure strain in a dog. The diode was placed near the dog's heart and the pressure of the heart provided enough energy to activate the diode. The strength of the signal the diode sent varied with the strains the dog was subjected to. R.C.A.'s Dr. Glo-

ver believes tunnel diodes will be used to measure strains in animals in space travel before man goes into space.

**T**HE TUNNEL DIODE also is less sensitive to radiation effects than the transistor. Hugh Lowry, manager of applications engineering in G.E.'s semiconductor products department, suggests the Esaki devices could be used in nuclear controls that operate close to radioactive materials such as those in a nuclear reactor.

• • •

The tunnel diode possibly is the most advanced of a number of important developments within the last few years in the fast moving electronics field. Still several years away from commercial applications is the molecular electronic or molelectronic concept which aims to replace many different electronic components with a single minuscule sliver of crystal.

A significant advantage of the molelectronic device is that it sharply reduces the number of connections and soldering points needed in an electronic system. An executive of an electronics company which is hard at work on both tunnel diodes and molelectronics believes the latter is an interesting, promising new concept whose general applications are several years away.

The tunnel diode, he adds, fills a "crying need" now for a semiconductor device that can operate at high frequencies and also improve many ways on the transistor. The use of either is possible.





The Bettmann Co.

Fashions in cooling change, and so do answers to the quest

## How to Beat the Summer's Heat

By Joseph W. Wassersug, M.D.

**W**HEN THE AMBULANCE brought him to the accident room of the hospital, his temperature was 104.2 degrees Fahrenheit and his skin was hot, dry and parched. He was a young man, a college student, and this had been his first day working with a road construction gang. The day had been a hot and muggy one. The temperature had topped 96° by early afternoon and the humidity was close to 90 percent.

Another road worker filled in the rest of the story. "The fellow was doing well," he said, "working along with the rest of the crew till late

afternoon. He had been sweating a lot but, about 3 o'clock, he was sweating any more, and he started to complain of a terrible headache. Within 20 or 30 minutes, he was half-conscious. Some of the men moved him into the shade of a tree and let him lie there until the ambulance came."

The doctors diagnosed the case as *heat stroke* and at once set about reducing the student's temperature to normal. Two male nurses immersed the heat victim in a tub of cold water while, at the same time, they massaged his limbs and trunk to

the circulation to his skin. In 45 minutes the lad's temperature was down to 103°. He was then out of the bath and attended with applied cold sponges. A cool sheet was placed over the patient's body and a fan was placed at the foot of his bed to speed evaporation and cooling.

A young man was watched carefully for signs of shock or congestion but in a few hours his temperature was down to 99° and he was feeling more comfortable. The doctor nevertheless decided to keep him hospitalized a few days until he could be sure his temperature remained normal. On discharge the college student was cautioned against vigorous work on hot days so he could have a heat stroke.

The case just cited illustrates how (or almost deadly) the effect of strong sunlight and heat can be on the human body. Still this year there will be hundreds of victims of *heat stroke* and thousands of milder cases of *heat exhaustion* and *heat cramps* unless proper precautions are taken. Hospitals, accident rooms and wards also have their usual quota of cases of *sunburn*. Yet practically all of us can avoid trouble on hot days by following a few simple rules based on an understanding of the problem.

All of us know that environmental heat is derived from the sun which heats the earth, air and man, but the problem is not as simple as it might seem.

Heating of the earth by the sun depends on a number of factors including air currents, clouds and humidity. Days that are gusty or windy, for example, seem cooler than days when the air is still. The cloudiness of the day also is important because of the clouds' ability to absorb some of the sun's heat.

### It's the Humidity?

Humidity plays a crucial role not because it regulates environmental temperature but because it can interfere with the normal cooling process of the body. Whether the day is hot or cold does not depend on temperature alone.

Internal heat or body heat is ordinarily constant and is normally around 98.6° F. However, body heat has to be dissipated or the body would burn up from its own heat-producing mechanism.

Body heat is ordinarily lost by *radiation*, *conduction*, *evaporation* and *convection*.

*Radiation* is the transfer of energy between bodies by electromagnetic waves. The flow of these waves is from the warmer to the cooler. Your body radiates its heat outward but it can only do so when the temperature of the environment is lower than that of your body. When environmental temperature rises beyond 98.6° loss of body heat by radiation is impossible. This is one reason why hot days are so deadly.

A second method by which the body loses heat is through *conduction* or the 'flow of heat'.

substance from one molecule to another." It varies with the nature of the material and its transfer from one object to another is influenced by the temperature difference, the surface and contact. In other words, sitting on a large block of ice will conduct more heat away from your body than sitting on a small ice cube or a large block of wood. If you get into a cool tub of water heat will be conducted away from your body through practically as large a surface area as possible.

*Evaporation of sweat* is another method by which your body gets rid of its own heat. In physical terms a liquid (sweat) is transformed into a gas by sweating and since it takes heat or energy to bring about this transformation the skin is cooled.

Body heat is generated by the body's ability to burn food through various oxidative processes. The heat of the body can be increased by conduction and radiation into the body from external sources or it can be lost by evaporation, radiation, conduction and convection. To keep cool you must take advantage of this knowledge.

## Two Ways to Beat Heat

Basically, then, there are two ways of beating the heat. *One: Alter the environment. Two: Alter the person.* Let's consider the latter first. Reduction of body heat never ceases until death, but the rate of heat production may be increased or reduced. For example, exercise increases your production of body heat. So does a heavy meal. Here,

then, we have one clue for the heat. Whenever possible strenuous work or physical and avoid heavy meals. Salt is are helpful when sweating is severe.

Body heat is lost in the environment through radiation and conduction but when air temperature is higher than skin temperature heat can be lost only by evaporation of sweat. This is a scientific fact, and it provides us with another clue for avoiding heat exhaustion or heat stroke.

On a hot day, everything should be done to encourage evaporation of moisture from the skin. Clothes should be light and loose-fitting. Use of fans or other devices to circulate air also aids evaporation. Tight fitting clothes or nonporous clothes do not permit free circulation of air.

Manipulation of the environment is a good way to beat the heat, whenever such manipulation is possible. This can be accomplished in two ways. Either (1) Go cool—to the beach or park or even into the cellar of your home or (2) Have a cool environment brought to you in the form of air conditioners, fans, or even a plastic bag filled with ice chips hanging on your head.

A simple, convenient and inexpensive method for cooling off is to wet two face cloths in cold water, wring them dry, place them in plastic bags, put in refrigerator and when properly chilled place one of them on your feverish brow while the

mains cold. When the one on head gets warm, you can put one into the refrigerator and put the second one that's been sitting there. In this way, by alternating back and forth, you have a comfortable forehead at least. Of course if you are fortunate enough to live in an air conditioned house so much the better.

### Acclimated

Another method of beating the heat goes under the long recognized and poorly understood term of *acclimatization*. When even strong healthy persons are first exposed to a very hot environment they find they are unable to work and strenuously. By a process of acclimatization they can adapt themselves to hot weather work and this adaptation is advanced in extreme heat performance can be nearly as effective as in temperate surroundings.

If you have to work long and hard in the summer heat don't try to do it all on the first hot day. Start gradually in the summer as you can build up your tolerance gradually.

Also be sure and take into account your age, physical fitness and availability of water and salt. Recent studies by the Army have shown that doctors gain considerable insight into the mechanism of acclimatization. When for example healthy young volunteers trained in temperate climates are exposed to tropical climates their pulse rate increases, their body temperatures rise and their blood pressure is unstable es-

pecially in an erect position. They may faint or collapse.

Even trifling work may become fatiguing, and more burdensome work rapidly leads to exhaustion. Thirst, headache, shortness of breath, giddiness, nausea, vomiting, loss of appetite, apathy, irritability and, ultimately, a complete unwillingness to continue work may result.

With acclimatization, however, this picture changes. If the work load is increased gradually over a period of about a week the same person can perform his work with only slightly higher than normal pulse and temperature. The man who was once exhausted is now cheerful, alert and vigorous and may be able to stand for hours without fainting.

In addition to perils of the heat itself there are the additional hazards of the sun's ultraviolet rays. Ultraviolet rays are responsible for giving your skin a fine, healthy looking tan. But here too you may be in great potential danger unless you know how to protect yourself.

Radiation that produces sunburn constitutes less than 0.2 percent of total sunlight but the degree of sunburn that develops from ultraviolet radiation varies with the individual. The dark skinned person is less susceptible to the dangers of ultraviolet than the person who is blond with blue eyes.

Besides individual factors may be racial or constitutional are also environmental. In the north temperate zone reaches its highest point

and it's quite possible, therefore, that a more severe sunburn may be received at the beginning of May than at the end of August. The possibility of burn is at its greatest when the sun is directly overhead.

The time of day is also important. Even on a bright, midsummer day, no sunburn is likely to occur from exposure before 8 A M. and after 4 P M., in contrast to mid day when the maximum degree of sunburn can be expected.

Conditions of the atmosphere contribute to the effects of the sun on the skin. Sky radiation which is sunlight that has been scattered by the gas molecules of the atmosphere, will produce burning without exposure to bright sunlight. On lightly overcast days therefore particularly in a fog, the burning rays are scattered and can produce severe sunburn. By contrast dust particles and smoke that contaminate the air may provide considerable protection against sunburn by absorbing sunburn producing rays. A cloudy day is no protection against sunburn.

According to one official publication of the American Medical Association 'Gradual exposure to the sun is the safest and simplest method of acquiring an attractive tan. This method allows the skin to build up enough natural resistance to the sun by increasing pigmentation. At the same time it minimizes the immediate possibility of a severe sunburn with its accompanying discomfort and disfigurement.'

Tanning lotions also may be used. Most of the popular makes are both

safe and reasonably effective. read the label carefully. The advantage of suntan preparations is that they permit a person to be in the sun for a longer time without severe burning than if the skin is unprotected.

### Suntan Lotions

Suntan preparations contain chemicals called *sunscreens* which block the burning rays in varying degrees. Of course some people are allergic to the ingredients of tanning lotions and this may add insult to injury. No preparation is guaranteed safe for all users, nor to protect persons under all circumstances. When wisely used, suntan lotions help.

Recently oral tablet medication has been developed to promote tanning of the skin. One of methoxsalen has been widely used with fairly good results but it is best to check with your doctor before going to the drug store for your supply.

One physician who tried the tablet on a group of Chippewa Indians is not impressed. He suggests that those who react excessively to light might be better protected by wearing wide brimmed hats and light colored clothing during the summer months.

. . .

There is no short cut to keeping cool. At one time or another during the summer, you may have to put into practical use all of the precautions mentioned in this article. But at least, you will know what to do.

An ingenious new method is expected to provide

# salted Sea Water for Israel

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*Condensed from Economic Horizons*

ISRAELI DEVELOPED PROCESS for desalting of sea water is about as developed on a major scale as announcement of American cooperation in the project made in Israel following the signing of an agreement between the Israeli Government and Fairbanks Morse & Co. for the development of

water is free of minerals including salts

Doctor Zarchin's invention solves the problem of achieving artificially what nature has been doing winter after winter along many coastlines of the world where the natives use such melted ice as drinking water

His method calls for the pumping of sea water and spraying it into a vacuum tank. Because there is no pressure in the tank, the water begins to evaporate quickly

This evaporation causes the temperature to drop sufficiently below the freezing point, freezing part of the salt water

While vapor floats up in the tank, the ice crystals fall to the bottom, in the remaining brine. This mixture is transferred to a second vessel during such transfer the brine and ice are separated mechanically

The vapor is meanwhile piped out of the first tank in order to maintain the vacuum there and into the second vessel where it meets the ice crystals melting them into water

Doctor Zarchin came from the Soviet Union

utilizing an electrochemical energy in Israel. The invention has been tested in laboratories and in a pilot plant on the Mediterranean coast of Israel, and built by Zarchin. The results of the tests are secret but engineers are convinced that Dr. Zarchin's desalting method would cost no more than the average price of well water in the United States.

• • •

The new process is based on the fact that ice formed by freezing sea

Economic Horizons published by the American Chamber of Commerce and Industry Inc.

a research assistant at the Leningrad Technical Institute. Working on similar problems there, he was awarded a prize by the Soviet government. Shortly afterward, he was arrested for "Zionism" and sentenced to five years of hard labor at the asphalt mines of the Ural Mountains.

David Karr, chairman of the executive committee of Fairbanks Morse, announced in Israel:

'After exhaustive study and tests by our engineers, Fairbanks Morse entered a joint venture with the government of Israel for the construction of plants to convert sea water into fresh water by means of the process developed by Dr. Zarchin.

"Construction of the first plant for mass production to be located in Israel will begin in 1960. We plan to locate a plant in a semiarid region of southwestern United States.

'Our next goal is to create plants to produce a billion gallons a day of fresh water for the world by the end of 1965.

'Our engineers estimate that when we achieve full and regular trial production, the cost of water under the Zarchin process will be as low as—or lower than—the average cost of delivering water to consumers in the United States, which is now approximately 40 cents per thousand gallons.

## Giant Reactor To Create New Elements

IN ONE of the giant atomic reactors at Savannah River, S. C., about a pint of plutonium, the atomic bomb element, is being bombarded with neutrons.

Two or three years hence, chemists will extract the world's largest quantity of the extremely rare manmade chemical element californium.

It is a step toward understanding and possibly using the heaviest known elements that can be converted in a step-by-step process into heavier elements.

Doctor Glenn T. Seaborg, Nobel laureate and discoverer of many of the new elements of the atomic age, described the

new long range national program to produce research quantities of synthetic elements 97, 98 and 99.

About 100 grams (three ounces) of curium, element 96, will be produced by 1963 in the first step. By then

there will be a high concentration of neptunium that will be created in the new reactor. At the end of two or three more steps, further changes will have occurred and there will be extracted about a gram of californium.

A milligram of californium is many times more than scientists ever been able to assemble. It is a treasure worth millions of dollars and has intangible value beyond price.



# What will it be like on the moon?

A prize winning scientist answers this question

by Dr Harold C Urey

Adapted from *Product Engineering*

THE SURFACE of the moon is a sandy desert somewhat like the Sahara. Gradients will not be much greater than 12 degrees. Even in the mountainous areas we will find no more than a few crags—just a gradient everywhere.

In addition, our study of lunar photographs indicates that the surface of the moon has many pits covered with a dark gray material. We do not know the depth of these pits, but they will obviously affect the design of any lunar car.

Another feature designers will have to consider is the chemical reactivity of the moon's surface. It is covered with a very high vacuum and has been thoroughly degassed for a long period of time. It may be that we'll find solids that are pretty sticky—

that the lunar vehicle may stick to this gravel.

There is also the possibility that oxygen has been driven out of the surface rocks in which case they may be chemically very active. We cannot know these things until we can actually put an instrument package on the moon.

## That Question of Temperatures

We know that temperatures will also have to be considered. On the surface, temperatures may vary from 100° to 125° Centigrade down to minus 100° Centigrade or more. Travelers will need to wear insulated suits to protect them from these extremes. A stroll by an individual would be quite hazardous.

## Atmosphere and Gravity

Every time we fly in one of our new jet airplanes we live in a vacuum—lack of an atmosphere is not too serious a problem. The moon's low gravity will



vantage in certain ways. Buildings can be made of lighter, even flimsy materials. We can throw up an enormous apparatus of some kind and not have to worry about wind blowing it down.

The gravity is one sixth that of the earth. This will make a big difference in the size and character of all structures. And I do not think we shall have to concern ourselves with radioactive substances on the moon—I feel that they will actually be less abundant than here on earth.

### How Do You Find Water?

I also expect that the moon's surface will contain water within the rocks as water of hydration. All we will need to do is establish a heating mechanism to raise the rocks to the temperature necessary to drive out the water. This also means that we can make oxygen without bringing it from earth. Solar reactors may eventually be used to do this, but at present they are expensive, fragile and hard to handle. If they are successfully developed, they could be a source of very cheap lunar power.

### And What of Food?

Of course all agriculture on the moon will have to take place in

closed places. There is no life as we know it that can survive the conditions of open lunar space. But plants or any other living organism would be killed within a few days by exposure to the ultraviolet and particle radiation on the surface of the moon.

We must either take food to the moon or attempt to grow it on the moon. And growing food on the moon will prove very troublesome because we must not think that the moon's surface soil. We know from our experience on earth that one cannot grow plants in fresh lava. The hydroponic growth of plants (tank farming) is not unknown on the earth and will be developed further.

### Power for Lunarites

It will be very difficult to transport major sources of energy to the moon. An atomic reactor is one possibility. Another possible source of energy that could be used on the moon, although it has never been tried on earth, is subterranean heat generated by the explosion of atomic bomb. Incidentally, I am advised by certain people that if we ever use hydrogen bombs beneath the surface of the earth, we will be able to use this heat to distill water. This process would be so inexpensive that we could use this water for irrigation.

If this is true, then desert regions that lie anywhere near an atomic power plant could all be irrigated. This too is an enormously important development that certainly should be pushed as hard as it can be.

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DR. HAROLD C. UREY of the University of California won the Nobel prize for his discovery and isolating heavy hydrogen. The discovery of chem. 100-100-100.

### To Get There?

fore we can reach the moon, have to develop a vehicle with a thrust engine. However there is something impossible in the actual amount of equipment necessary to instruments on the surface of the moon. The big thing we need is an administrative decision in Washington that it shall be done and that the cost in dollars and manpower will be paid. To me it was simply amazing that the same week the Soviets hit the moon we cut back our appropriations on jet propulsion. The design problems involved in going up to space will have to be solved by today's engineers. Within a few years they will be able to send a vehicle to the moon that will bring information back to us. Now I am very sorry to say that it is as though the USSR is not going to do the job before we do it. We will do it first because they are still working on space problems. We did

about ten years ago we said it was impossible to use talking about intercontinental ballistic missiles because the effective range of the A bomb was too small and the development of precision guidance mechanism was unlikely. It was the development of the H bomb that really made the ICBM so important.

The Soviet government on the other hand decided it would make a big effort to develop missiles big enough to carry large A bombs to do the job. They made their decisions early and headed in the direction of getting an efficient rocket engine.

In the experimental sciences, great men are never the promoters of absolute and immutable truths. Great men may be compared to torches shining at long intervals, to guide the advance of science. They light up their time, either by discovering unexpected and fertile phenomena which open up new paths and reveal unknown horizons, or by generalizing acquired scientific facts and disclosing truths which their predecessors had not perceived.

—Claude Bernard

### Why Go to the Moon?

I think the whole space program will pay for itself even if we bring back nothing from the moon—or, later from Mars and Venus. In attempting to live and travel on the moon for example men will overcome earth world difficulties in construction and design. Transistorized apparatus will give us communication equipment that is less massive.

When an enormous effort has been made to reduce the weight of apparatus to a minimum it can be expected that many terrestrial applications will become feasible. Such applications will probably pay the entire cost of space exploration. Surely the communications satellites will further the transmission of information on earth.

Secondly there is the enormous thrill we can all get. We can talk about exploration to the moon, climbing Mt. Everest, and the joyous pleasure in these adventures. We can see the back side of the

my mind, the most amazing feat of exploration since Columbus. What are we going to spend our money for in this age of the different society? Just to let someone make a car two feet longer and another foot wider? What is the use of this? I have everything I want. I do not need more food or clothes. I am not a tr... sh

As far as intellectual gains go, space travel will enable us to under

stand much more about the origin of the universe than we have ever understood in the past. Because the moon is a dead object, it has a preserved record of what has happened in the solar system—any other accessible object.

Also our view of the distant stars will be greatly improved and this will enable us to learn much more in regard to the structure and processes of the universe.

## Find New Clue to Inherited Diseases

SCIENTISTS HAVE DISCOVERED a strange trait inherited by fruit flies which provides a possible clue to why people keep getting some rare inherited diseases.

The fruit fly trait is harmful—it can kill offspring whose parents both transmit it. Since the fruit fly trait violates the law of natural selection, the trait should almost disappear, the law predicts.

The law of natural selection states that inherited traits which are most advantageous to a species will survive while harmful ones should almost disappear.

Doctor Laurence Sandler and research assistant Yuchiro Hirazumi of the University of Wisconsin say the trait actually seems to occur with increasing frequency. It appears to have existed in flies for a considerable time.

Doctor Sandler explained that a curious destructive gene is responsible for the continued occurrence of the fruit fly trait. He thinks a similar gene might cause the unexpected high frequency of occurrence of the inherited human diseases.

up chromosomes in cells—are the messengers which transmit inherited characteristics. Genes occur in pairs in cells—two for each characteristic—normally do not affect one another. The curious gene found by the Wisconsin geneticists does something no other genes do.

Some sperm cells getting the broken chromosome will not fertilize eggs. Thus, only the SD gene's characteristics are passed on.

Though SD like genes could build up harmful traits on a species, Dr. Sandler said that the presence of such a gene apparently does not mean certain extinction for the species. The explanation he said lies in the fact that the SD gene's partner seems capable of building up a "resistance" to being broken. Dr. Sandler explained how this might occur. He said that not all the SD gene's partners are susceptible to being broken; the sturdy ones survive.

Genes—tiny elements which make



## HAT'S YOUR MIND ?

### RICHER NOTES 3 500 DIFFERENT LANGUAGES

Three people from different parts of the English speaking world are in the same room and they may end up talking to themselves.

To avoid maximum confusion the first subject should be a Lowland Scot who speaks Broad Scots, a native of southern India who speaks English in his homeland, and a third person might come from another part of the world where English is the national language.

Eric P. Hamp, associate professor of linguistics at the University of Chicago, says these three would not understand each other. He is not talking of limited communication but of total incomprehension.

They might just as well be speaking Dutch, Danish and German, says Hamp.

Preparing a course on *Languages of the World*, Hamp recently released figures showing there are just 3 500 odd different lan-

guages living and dead, which are or were known to be in use in some part of the world. The estimate is a conservative one and does not include any of the numerous pidgin or creolized tongues.

Hamp says: "I use the term language to describe any single system of speech that is intelligible to the users of no other speech system. A New Englander, a Southerner, an Australian, an Irishman and a Cornishman while they have different dialects can communicate with each other. I do not call these various speech forms languages and consequently do not count them separately."

But Broad Scots, Indian English (not Oxford English which



many Indians speak) and all other forms of English constitute at least three mutually unintelligible groups and are counted as such.

### NEW BUSINESS PHENOMENA: THE ORGANIZATION MAVERICK

Individualism in the executive suite has become a desirable thing in recent years.

But Director George S. Odorne of the University of Michigan Bureau of Industrial Relations says that new values will be overnight among our

Written in the U.S.

*Review*, Odiorne says, "The company which is manned by alert managers has undoubtedly already begun switching its signals among the

people dull to messages emitting from the offices where the brass is situated

"The antennae of their 'radar sets' have already begun to point up that the Old Man is calling for individualism, for nonconformity, and maverickism. The lesser lights may be counted upon to respond to this faint but clear message," Odiorne predicts.



"The real problem is this: what is the acceptable mode of behavior for the New Maverick? You may rest assured that it will not extend to punching the Old Man in the nose or stealing his cigars, but will nestle itself closely to the image of maverick behavior that can be induced from what he says and what he approves.

"Certainly there will be more tough talking about the need for backbone and up-to-date versions of Elbert Hubbard's homilies out of past. More often there will be a shrewd attention to the arts of disagreeing and speaking up freely when in the presence of the seniors

without actually saying an intemperate or brutally frank.

"Once these superficial arts of adapting outward behavior to new line of maverickism have firmly installed, there still the basic problems of what thinking junior or middle should do in order to overcome debilitating effects of too much conformity among high talent people.

"Most of the lasting effects of New Maverickism will be the an infusion of individualism business from the recruits.

In some instances, he believes will accelerate the rise of individualism and maverickism in old who have carefully concealed tendencies in this direction the regime of sentimental togetherness.

The major immediate effect, however, among the expert bulk of managers and staff will be a new conformity—to a behavior which looks like maverickism," concludes.

#### NATURE OF HYPNOTIC CONTROL DISPUTED BY EXPERTS

To what degree can a hypnotist control a person and what is the nature of this control?

Can, for example, a hypnotist freely exert his will upon a subject? Or does the nature of hypnosis limit the hypnotist merely to focusing subject's attention on ideas which he later acts in his own will and according to his own experimental learning independently of the hypnotist's personal wishes?

rding to *The New York Times* on to this problem might be in a test that would determine whether a person can be hypnotically to commit an act would be unacceptable both to society and to himself.

Dr Martin T. Orne of the Medical School cited experiments in which persons performed antisocial and even self-harmful acts under hypnotic suggestion.

He points out that the subjects were motivated to do these things for the sake of the advancing science and knowledge and they felt that the hypnotist would insure the safety involved.

In the past 25 years Dr Orne said there have been only three documented cases reported of actual criminal behavior involving hypnotic suggestion.

He said however that he did not think it likely that a "cunning hypnotist" could force another individual to do his criminal bidding by hypnotic suggestion.

Dr George H. Estabrooks cited one well documented case in which a person committed murder after criminal acts at the behest of a hypnotist.

He said that a possible explanation for this case might be that the hypnotist had altered the subject's personality, making the criminal act perfectly acceptable to him. He offered a different view of what hypnosis is was offered by Dr Milton Erickson of Phoenix, Ariz., a leading authority in the field.

"Hypnosis is a state of awareness that can be directed. A hypnotist merely attracts a person's attention and asks him to use his own body learnings and conditionings according to his own experience."

#### **'TRANQUILIZER GUN' MAY BE ADAPTED FOR HUMAN USE**

The tranquilizer gun which is used extensively in the cattle industry is being studied with the idea of developing a similar device for human use.

Sheldon H. Feurt, dean of the University of Tennessee College of Pharmacy and inventor of the gun, believes it would be valuable in many emergencies such as rescue work in which the delivery of liquid drugs or sedatives over relatively long distances is desired, *Scope Weekly* reports.



For instance, it could be used to administer a sedative to a fallen mountain climber to ease his pain. In addition, Dr Feurt thinks the gun if used by qualified personnel could be utilized in certain police work, such as halting or prison riots. He also sees a "remote" possibility of its being used to shoot drugs into dangerous mental patients.

The tranquilizer gun looks like a conventional weapon.

*Review*, Odiorne says, 'The company which is manned by alert managers has undoubtedly already begun switching its signals among the offices occupied by the lesser ranks. Twenty years of hiring and training for conformity hasn't made these people dull to messages emitting from the offices where the brass is situated.

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The tranquilizer gun is a conventional weapon.



oversize barrels. It shoots a special hypodermic syringe, which injects its contents on contact with the subject. It comes in two models: a rifle accurate up to 50 yards, and a pistol accurate up to 20 yards.

The gun is now employed chiefly to quiet unruly cattle, to administer liquid medicines to sick animals, and to aid in the capture of suspected rabid dogs.

### SPACEMEN AND SECRETARIES SHOW SAME NEUROSES

Two airmen who were confined in a simulated space cabin for 14 days developed the same psychic symptom as white collar workers.

The pair had persistent and recurrent headaches, *Factor* reports.

They were the same kind of headaches often found in secretaries and other people who don't have a chance to move around much on the



job, said Dr. Richard Thomas Day, physician who monitored the two during their confinement at the Air Force's School of Aviation Medicine at San Antonio.

Doctor Day noted that the two airmen were subjected to these sources of stress:

1. Constant noise from the equipment—comparable to the incessant of typewriters in an office.
2. Feeling of being watched and

overheard—comparable to the boss keeping an eye on his employee and an ear ever tuned to what he says.

3. Monotony of the routine, comparable to having to go through the same motions all day long on a job.

### MOST MURDERERS SANE, PSYCHIATRIST FINDS

Most murderers are not mentally ill, but they have an abnormal, infantile disregard for human life.

This is the conclusion of Dr. Manfred Guttmacher, in a new book, *Mind of the Murderer*. Dr. Guttmacher, who teaches psychiatry at Johns Hopkins University and the University of Maryland, is in private practice and for 25 years has been chief medical officer to the Supreme Bench of Baltimore.

Of 175 cases studied by Dr. Guttmacher, 53 of the murderers were mentally ill and 105 were clearly psychotic. The remaining 17 were seriously abnormal but a psychiatrist at the time of the crime could not definitely establish it.

Nearly every murder committed by an insane individual is preceded by some signs of insanity, Dr. Guttmacher said. One-third of the sane murderers had been previously institutionalized for mental illness.

The crimes of an insane killer are generally very bloody and planned. The victims are often intimate associates, frequently his children. Most insane killers have no remorse and confess freely. Their motives seem completely foreign to a sane person.

The Library  
of Congress has  
information on  
everything from  
flapjack flipping  
to the color  
of a mastodon's eye

## Four Hundred Miles Of Bookshelves

by Jay Scriba

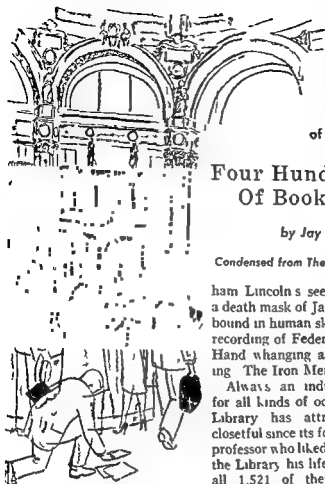
Condensed from *The Milwaukee Journal*

ham Lincoln's seed pearl necklace, a death mask of James Joyce, a book bound in human skin and a scratchy recording of Federal Judge Learned Hand whanging a guitar and singing 'The Iron Merrimac'.

Always an indulgent repository for all kinds of odds and ends, the Library has attracted a giant's closetful since its founding. An Ohio professor who liked flutes once willed the Library his lifetime collection—all 1,521 of them. The creator of 'Hopalong Cassidy' contributed manuscripts of 30 western novels plus 10,000 card references on everything from flapjack flipping to Apache scalping techniques. Actor Jerrold Hersholt gave a \$75,000 collection of Hans Christian Andersen.

The curious visitor to the vast rococo building across the mall from the capitol dome must expect startling juxtapositions:

*The Milwaukee Journal* (May 14)  
by The Journal Company 34



FEW YEARS AGO a Chinese cook from Muskegon, Michigan, sent a smoked fish to the Library of Congress to try to establish copyright in the recipe for cooking it. Impressed by the man's seriousness, if not his judgment, the Library tucked the little fish away in the vaults. The donation was only a little unusual. The Library already had a fish when Samuel Johnson's cane, Mrs. Abra-



e typewriter and multicarbon  
pies As a result, whereas Abra  
m Lincoln left 18,350 personal  
pers in the White House after his  
assassination presidents after Cool  
e have had to find separate hous  
for their bales of paper mementos  
Chief task of the Library is to pro  
le information that can be found  
where else To do this job it has  
n forced to become a near mira  
of organization and efficiency

### Books on Loan

While the Library is still, techni  
Congress library, in effect it is  
the library of the nation Any  
over 16 can use its facilities  
a surprising minimum of red  
While it is not a circulating  
ary—you can't take a book from  
s to  
the  
a 20 million catalog  
s each year to 9 000 libraries,  
ng them time and expense It  
ishes the National Union cata  
ch

ie Library also answers ques  
and it is seldom stumped  
was the color of a mastodon's  
What is the weight of the  
on the capitol building? How  
v words are there in the English  
tore? Could you suggest a name  
wins? From 9 in the morning  
is late as 10 at night clerks  
on the thousands of questions  
flood in by mail telephone and  
reason  
holers find the Library a par

ticularly happy haven With its 414  
miles of bookshelves 225 special  
study rooms and multilingual staff,  
there are few aids and comforts the  
library can't provide

'People come in here desperate  
because they lack the information  
they need to write a book or a the  
sis the chief of one highly special  
ized section has said but after  
three or four weeks they avoid meet  
ing my eye for fear I may give them  
more material As a result of this  
warming atmosphere the Library  
estimates that there are always at  
least 200 books in preparation with  
in its walls



Last year the legislative reference  
branch of the Library handled  
77 396 queries from congressmen a  
12 percent increase over 1958 and  
80 percent more than in 1950

Since the Library has grown into a  
formidable institution in its own  
right congressmen sometimes grum  
ble at appropriation time Most law  
makers applauded however when  
the Library established an oriental  
research center in Japan and sent an  
expedition to Palestine to photo  
graph rare manuscripts at St Cath  
erine's oldest Christian monastery  
in the world Officially the only re  
gret at the Library is that it di  
get to Ieping China in  
card a va t number of  
that now may be lost

The Library own.

eign collections in the world of Chinese Japanese and Russian books. It owns the libraries of Czar Nicholas II and Adolf Hitler a set of Rudyard Kipling's poems printed on dessert plates microfilm copies of all Sears Roebuck catalogs since 1888 and the personal papers of Gen. Billy Mitchell. Its stacks hold 24,000 books on magic the world's most complete hypnosis library dozens of scores written by Bach and Beethoven and a complete file of the *London Gazette* from 1665.

A record collection at the Library includes Iroquois Indians chanting rain songs Mississippi boatmen bawling out their sounding calls and Pennsylvania miners singing hymns deep in the pits.

Its film collection begins with the first motion picture ever copyrighted Thomas Edison's presentation of 'Fred Ott's Sneeze'—running time from gasp to Gesundheit two seconds.

Various departments of the Library offer talking books to the blind chamber music concerts played on its own Stradivarius violins and reading by such noted poets as T. S.

Eliot, W. H. Auden and Robert Frost. The Library keeps people staff who can speak Moscovian and in the Cyrillic alphabet. It subscribes to 1,400 newspapers and 600 magazines. It prints dozens of publications on its own press and sells unusual phonograph records.

### "Dial a Book" Plan Proposed

To give better service the Library is experimenting with a system whereby a patron could 'dial a book.' It is also working with a microcard system whereby a special camera can reduce a 500-page volume to one three-by-five-inch card easily legible under a special enlarger.

But with all its virtues a library can take comfort in the fact that there are some things that even the Library of Congress does not have or does not have. It has a 175-

year collection of literary fancies that even its most imaginative inventors have never been able to classify. It does not have a copy of *The Whole Booke of Psalmes*, the first book printed in this country in 1640.

### Roaches May Spread Food Germs

COCKROACHES MAY BE spreading food poisoning germs, a study at Kansas State University indicates. Dr. T. H. Lord, Kansas State bacteriologist, captured 100 groups of brown-banded roaches and found that about one-fourth contained the bacterium *Staphylococcus aureus*, which is responsible for food poisoning.

Because 25 percent of the roaches

contain this germ, Dr. Lord thinks it reasonable to assume that food poisoning germs may be spread to uncooked food or to other places by roaches.

• • •

The brown-banded cockroach is difficult to control, he said, because it travels over a wider area in search of food than the German cockroach.

# Cold Facts About Cryogenics

CONSIDER a new super energy rocket fuel that will give the United States an unrivaled lead in heavy vehicles, a hypersensitive electronic device which can detect radar signals returning 257 million miles from Venus, a new method of storing human blood indefinitely—these but a few of many new dramatic developments made possible by the use of cryogenics.

Although the field of cryogenics is relatively new, the name itself is derived from the ancient Greek word "kryos" meaning "icy cold." In its present connotation, cryogenics is synonymous with the science of extremely low temperatures approaching absolute zero. At this end of the temperature scale—in contrast to the limit of the hot end—there is a lower limit, minus 459.69 degrees Fahrenheit or minus 273.16 degrees Centigrade, below which the temperature cannot drop.

In this frigid realm "everything happens differently." Molecular mo-

defies gravity and creeps up and over the walls of containers [See "The Gas That Defies Gravity," SCIENCE DIGEST, Oct. '59] and metallic lead rings like a bell when struck.

As early as 1799, the French scientist Guyton de Moreau converted ammonia gas into a liquid by cooling it. A quarter of a century later Michael Faraday, famed English physicist, succeeded in liquefying numerous gases.

The general principle in the liquefaction of gases involves forcing the gaseous molecules close together to form a liquid by subjecting the gas to pressure and cooling.

A gas is first compressed and the heat of compression removed. Then the gas is allowed to expand in a closed system whereupon it becomes cooler—a phenomenon known as the Joule Thomson effect.

The first portions of the cooled gas are used further to cool subsequent streams of the incoming gas until the liquefaction temperature is reached.

Cooling processes such as that just described, however, are sufficient for reaching tem-

low that of liquid helium. To drop the temperature the remaining seven degrees Fahrenheit toward absolute zero, scientists of the Arthur D. Little Company have developed an ingenious "magnetic refrigerator."

The first and still by far the largest commercial application of cryogenics is the production and use of liquefied gases—of which \$250 million worth are consumed annually. Last year alone over 70 billion standard cubic feet of liquid oxygen were produced in this country. About half of this oxygen output is used by the steel industry.

Oxygen enrichment of the air blast used in blast furnaces has increased iron output 10 percent or more at a cost of about \$5 per ton for the oxygen. Similarly, the use of high purity oxygen in open hearth furnaces and electric furnaces has been found to reduce the time required to oxidize impurities with consequent increase in steel production.

**A**NOTHER BIG CUSTOMER of high purity oxygen is the chemical industry which utilizes it in manufacturing ethylene oxide. Oxygen is also used in the partial oxidation of natural gas to such important compounds as acetylene, formaldehyde, and alcohol. Many chemical engi-

neering processes conducted at cryogenic temperatures are providing interesting and promising results which will ultimately be translated into greater efficiency and new products.

Liquid oxygen also constitutes a convenient method of supplying breathing oxygen to passengers and crews of high altitude, long range global aircraft. It replaces the bulky compressed oxygen cylinders previously provided for this breathing necessity.

About ten years before World War II, German scientists foresaw the possibility of using liquid oxygen as a compact oxidant in rockets. With the advent of the jet and rocket age, liquid oxygen—"lox"—as it is called, has established itself as an important component of fuel mixtures.

Last summer the Air Force moved the sign "Apex Fertilizer" from a sprawling West Palm Beach plant which purportedly was an ammonia production unit to a design for manufacture of liquid hydrogen.

The Air Force has labeled liquid hydrogen "the ultimate chemical fuel" and early this year the Naval Aeronautics and Space Administration announced it was redesigning the upper stages of the Saturn rocket to use liquid hydrogen as

This fateful decision constitutes a technological gamble to overtake the Soviet Union's lead in rocket. In effect, the space agency is putting its chips on the ability of hydrogen rocket engines to hurl multiton

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 Doctor William W. Haecker, Jr.  
 . . .  
 . . .  
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space The payload capacity of the Saturn with hydrogen tanks in the upper stage will possess the capability of sending manned capsules on a round trip to moon

liquid hydrogen as a rocket propellant used in conjunction with liquid oxygen can produce about 30 percent more power than the kerosene-liquid oxygen pair that has generally been used to power rockets

clustering eight rocket engines in the first stage and utilizing liquid methane as the oxidant (agent to speed up the release of oxygen), the Saturn will produce 15 million pounds of thrust at take-off This is 10 times that of existing U.S. rockets and double the thrust used by Russians for space launchings

Equally spectacular is the impact of cryogenics on the field of electronics Fifty years ago Heike Kamerlingh Onnes, a Dutch scientist studying the behavior of matter at extremely low temperatures discovered that some metals lose all electrical resistance just above absolute zero and become superconductors Once started such an electrical current will continue to flow through a superconducting circuit indefinitely

This phenomenon of superconductivity is the basis of a project sponsored jointly by the government and International Business Machines to develop a cryogenic computer enclosed in a frigid cabinet no larger than a basketball! Such a miniaturized unit would be the answer to the rocket designer's dream of a compact

computer that can be snugly accommodated in a space satellite

IN PLACE OF transistors, tubes and magnetic cores, this miniature computer will use ultrathin glass wafers sandwiched together with microscopic deposits of conductors such as lead and tin. When immersed in a liquid helium bath, these circuits have a switching speed 50 times that of the fastest transistor and can operate indefinitely at speeds of a billionth of a second without wearing out.

At ultralow temperatures, infrared and microwave instruments also become extremely sensitive. When cooled to cryogenic temperatures, anti-missile missiles using infrared devices to track down their targets are able to sight approaching missiles at four times the distance previously possible.

And solid state microwave amplifiers known as masers when cooled in liquid helium at minus 452 F. become extremely sensitive receptors capable of detecting a radar signal rebounding from Venus. They can pick up in New Jersey signals that have been bounced off an artificial satellite in California.

Researchers at the Bell Laboratories believe this development portends the use of cryogenic masers in the establishment of a global communications system which would include the transmission of television images as well as written

Other government workers have perfected a cryogenic method of freezing whole blood and



stead of for the three week period currently used

Workers at Syracuse University are using cryogenic temperatures to preserve semen for artificial insemination experiments with cattle. And the use of liquid nitrogen as a coolant in shipping containers offers distinct advantages over ice in shipping perishable foods long distances.

Aside from the innumerable practical benefits obtainable at low temperatures, cryogenics also offers scientists an unparalleled opportunity to study the basic properties of matter. For as molecular motion comes to a virtual standstill at temperatures approaching absolute zero, the individual characteristics of matter become more apparent.

At a recent meeting of the American Physical Society, Dr. Donald

Hughes of the Brookhaven National Laboratory reported that he had successfully used cold neutrons (cooled in liquid air to about minus 400 degrees F) to reveal the motions of atoms in liquid water.

From his studies, Hughes concluded that the atomic motions of water resemble much more those of a solid than of a gas.

THE SPECTACULAR GROWTH of cryogenics since 1945—when there were only seven laboratories in the country devoted to low temperature studies—is evidenced by the existence in 1960 of over 1,000 low temperature processing plants in the United States. In fact, the cryogenics industry is doubling in growth about every four years. And this, experts agree, 'is only the beginning'.

## Viruses Cited as Argument for Spontaneous Generation

THE THEORY that new life may originate spontaneously from organic matter, popularly believed to have been disproved 100 years ago, has been advanced by a biologist.

He cites the difficulty of fitting viruses, bacteria, certain algae, and

from a complex organic environment already present.

This disputes the current theory of evolution that holds life originated from only one case of spontaneous generation and that all subsequent forms of living things have evolved from that case.

Doctor John Keosian, director of natural sciences, Newark College of Rutgers University, reported in journal *Science* that it would be implausible to accept present day viruses as units of recent and present origin, or to suppose they have descended through some 2 billion years relatively unchanged.

He asserted that it should not be assumed that an organism, simply because it is newly arisen, would have adaptive features to cope with competition. Also, organisms with incomplete metabolisms may arise and survive by becoming parasites on existing organisms having complementing metabolisms.

An instrument called  
the electron microbeam is

## Detecting Art Fakes and Forgeries

Condensed from *The Technology Review*

BEHIND A LOCKED DOOR on its third floor the Boston Museum of Fine Arts has a collection of beautiful things that it never displays as well as downstairs it has many types and all sizes of *objets d'art* from many parts of the world and many periods in history, but these are fraudulent.

They stand amid scientific instruments with which this has been given. William J. Young, the young gentleman who heads this laboratory has devoted years—like his father and grandfather—to exposing fakes.

He and his colleagues in other museums and laboratories have examined many masterpieces fluoroscopically, spectroscopically and by other aids to perception. But still some works of forgers are in great museums and deceive collectors, dealers and students of art because of the craftiness, the talent and the patience of the criminals who produced them.

Henceforth it will be easier to detect falsified art thanks to the development of an instrument called an electron microbeam probe.

Its potentiality in the art galleries was demonstrated last winter by a Massachusetts Institute of Technology graduate student Norman L. Peterson. With it he proved beyond a possible shadow of doubt that a puzzling portrait of a lady (see p. 41) which was purported to be the work of a 15th century Florentine artist was a phony.

The electron microbeam probe is so new that only a few researchers have used it. There are less than a dozen of these probes in this country and about the same number overseas. Already however they have revealed so much about a great variety of solid materials that the Institute is offering a special course this summer in the design and use of the electron probe.

To appreciate what Peterson did you must know a bit about both the forger's bag of tricks and this new means of detection.

### Buried Evidence

The prices now paid for ancient art are as alluring to some men as the vault of a bank and some have simulated art with incredible skill. They have pitted themselves against not only the experienced eyes of critics but also the x-rays, the microchemical techniques and the historical and scientific records available. Young and his colleagues for which they have played a croupier tremble.

Hence the odds, to some gifted criminals, have not seemed too great.

The forger never can wholly hide clues to his deceptiveness. Some of the materials and techniques of artists in bygone days and faraway places are no longer known—the secret of manufacturing a blue found in the Palace of Knossos in Crete and in Roman wall paintings for example was lost between 200 and 700 A.D. But it is possible for a forger to bury the material that would betray him so deeply in layers of paint or metal that suspicious men will not dig for it.

Honest investigators, their employers and other lovers of art often are loathe to remove even a small part of a possibly irreplaceable object for chemical analysis. Their reluctance to mar what is represented as and looks like, a genuine artistic and historic treasure can be counted on by a talented forger. Indisputable evidence of the guilt of the painter of the portrait which Mr. Peterson exposed lay behind this barrier to the use of conventional techniques.

Yes, what is it?

1 painted over another picture which was probably valuable—but might not this have been done by a Florentine artist in the 15th century?

When part of the patina was removed the portrait seemed strikingly beautiful. Many comparable

pictures are highly valued and others who saw the painting in his laboratory wished that it could be displayed publicly. Had the lady been wrongly imprisoned in his collection of fakes? Her admirers hoped so—and some of them thought so.

### Analyzed 4 000-Year-Old Glass

Young learned about the electron microbeam probe as a result of his friendship with Robert E. Ogilvie, assistant professor of metallurgy at MIT. The probe was being used in Ogilvie's laboratory to study matters as the history and composition of meteorites. Obviously it could penetrate mysteries that tantalize the curiosity of esthetes as well as scientists.

Peterson used it to analyze brown stripes about which were curious on a piece of Faience—decorated glazed quartz that was produced about 2000 B.C. These stripes were only about a millimeter wide but more important enough when compared to amount needed for analysis. They were potassium silicate. Peterson reported and contained some of the material which produced the color.

In analyzing a speck of 4000-year-old Egyptian glass, which was mainly blue but had a brown pattern on it, he discovered that color was responsible for the blue and the brown areas contained manganese.

Peterson also demonstrated the probe's versatility by using it to analyze a bit of glaze from a statue of a boy made in Whittington in

century After mounting this of material in bakelite polish and placing it in the instru he reported that this glaze was lead but contained small amounts of zinc and iron

great advantage of the instru was that not only a qualitative but a quantitative analysis could be made of an extremely small piece of material A mere sliver, thinner

a human could suffer This was metallurgical work here using the probe to find out what it was made of and to trace the migration of metal into the metal when the probe was used to

suggest the metal is that could be the probe to obtain the

of metallic objects With a probe of ancient bronze Peterson found that the difference in the electrical activity of copper and tin resulted in significant changes in

the layer was formed over a wide layer The probe pointed out while these experiments were being performed that

the soldering in ancient objects also could be analyzed and dated approximately by noting its diffusion into the material on which it had been placed Work done to restore a work of art might thus be disclosed

But might not a forger fool later investigators by holding his work at a high temperature before offering it for sale? No because the diffusion gradient of say tin in copper would differ in an item that had been annealed for a short time at a high temperature from that in one in which the diffusion had taken place at room temperature for a number of centuries

Before a large picture such as the lady's portrait could be tested with an electron micro

beam probe however a way had to

be found

revealed now at a Chicago meeting of the American Association for the Advancement of Science

Some of the newspaper accounts of his work which were published then implied that an electron beam probe was a relatively little gadget Actually it



complex and very expensive instrument. In it a finely focused beam of electrons is used to excite atoms. The radiation that these atoms then emit is analyzed to determine both what the atoms are and where they are. Such delicacy is not easily attained.

With the MIT instrument any element that is between magnesium and uranium in the periodic table can be found in an object that is only 1 micron (one thousandth of a millimeter) in diameter.

### The Evidence Obtained

The sophisticated example of art forgery which Young asked Peterson to investigate with this device is about six times the size of a page of this magazine. How would you go about determining the authenticity of a painting that large with an instrument built to study things so tiny that you could put them in your eye and never feel them?

In the same way a geologist finds out about parts of the earth which he cannot reach—but with a tool originally made for physicians. A core of the material in the painting was extracted in a hypodermic needle. The finest needle on the market was jabbed right into the lady's cheek.

You cannot see the hole that is left unless you stand very close to the picture and ask Young to point it out. Even so the core that came out in the needle was 50 times as wide as was really needed.

Finer needles can be made and the holes left can be so small that they

will be invisible to an art connoisseur's unaided eyes.

The next problem that confronted Peterson was how to expose the paint and other material inside the needle to the finely focused beam of electrons inside his instrument. It had to be done without contaminating or mixing the pigments, so Peterson filed away one side of the needle. Then he evaporated a thin layer of aluminum over this shred of evidence in order to carry off the current of the electron beam and to prevent a charge that might deflect the beam from being built up.

A painting is a stratified structure. When Peterson placed the specimen in the probe he could, with the help of the optical system, see distinct strata. He was able then to focus the electron beam on each layer and discover what each contained, individually.

### Titanium Was the Tattler

The artist had covered the original painting with a layer of white paint. To give the lady her fine complexion he also had mixed some green on his palette and his brush had left a layer of it where the investigator's hypodermic needle pricked her cheek.

When the electrons were focused on the white layer and X rays from it were scanned, Peterson saw that this white paint contained titanium. Similarly, when he focused the beam on the green part of the core, he saw that it contained chromium with more titanium. It wasn't necessary to look further into the matter.

titanium was first used in paint in 1916 and has only been found in pigments of portraits made after 1920. Chromium has been used in Prussian blue, for example, and chromium oxide might be found in a painting made as long as 1862.

These and other such dates are reliable matters of record. Neither uranium nor chromium would have been in this masterpiece if it had been the work of a 15th century Venetian artist. It was clearly a forgery—and a recent one. I suppose, however, that the forger had not covered the original picture showing the lady's portrait in this way. He might, instead, have tried to enhance the value of a 15th century picture simply by putting a famous artist's signature to it.

But in this case the needle could have been inserted into the signature. Then the pigments of the paint used for the signature could have been compared in the probe with those in the painting beneath it.

Nature's masquerades are often more effective than those devised by men: cupidity. Some of these are being explained with this instrument at MIT. It is being used in deter-

garding materials to which men entrust their lives

When more schools and industrial laboratories can help the way MIT has there will be, curator Young feels fewer phony 15th century ladies inhabiting the world of art.

## "Space Lighthouse" Is in Orbit

is a space navigation system  
uch may revolutionize the art of  
vigation

With the aid of a Transit satellite system ships and planes of all nations will be able to fix their position with greater accuracy than with the present means of looking at the stars or tuning in to radio stations. Navigators will have a worldwide system that can be used in any kind of weather.

Transit 1 B is a 265 pound 36 inch

sphere The satellite missed going into the near circular orbit that was planned for it and went into an elliptical orbit with a maximum altitude of 479 miles and a minimum altitude of 233 miles Because of its lower than planned orbit Transit 1 II is expected to last only about 18 months

Two days later the eleventh series of Discoverer launched The launching itself set but the Air Force again recover a 300-pound ejected from the orb t

*There is the possibility that man may hop the fences of his planetary backyard to reach . . .*

## STARS IN OUR NEIGHBORHOOD



*by Fritz Leiber*

WITH SPACEFLIGHT making giant strides and astronomers swinging around toward the belief that many suns have families of planets the nearest stars of our own sun have become of more than purely astronomical interest. We just might some day reach them.

Naturally our sun's own planets and their moons will be the first objectives for exploring spacecraft, manned and unmanned. However, the chances of finding any life, except on Mars, are not large, while the hope of getting in touch with nonhuman intelligence in our own planetary backyard is small indeed.

But if the search be widened to take in neighboring stars and their possible planet families—who knows?

There are about 100 billion stars

Some of these stars burning with fierce white or blue atomic fires are as much as ten thousand times hotter than Sol, our own sun.

Some, glowing redly, are ten thousand times fainter.

Sol, a yellow star of medium brilliance and the type known as G, is a nice comfortable middle-of-the-road—*not* big but *not* small either. In contrast, some stars are so big, that if one of them were in Sol's place, it would engulf the earth and all the other planets out to and including Saturn, while a lot of tiny stars are actually smaller than the earth.

Some stars of the Milky Way multitude are as much as 70 light years away—that being the distance light travels in 70 years, legging it along at 186,000 miles a second. Such stars, lying at the far edge of the great galactic saucer, are clearly impractical targets for interstellar exploration.

Of the Milky Way's 100 million stars only a few thousand are visible to the naked eye; the rest are known by telescopic study ("telescopic stars") or by inference.

A hundred or so of the brightest of the naked-eye stars have individual names given them by the Greek and Roman star watchers: Sirius, Arcturus, and Capella, for example—or by the star-gazers of the Dark Ages, who were responsible for such star names as Achernar, Altair, Formalhaut, and Betelgeuse.

These and others of the brighter stars are also named for the constellation or mythological star pattern in which they appear, plus an identifying Greek letter. Betelgeuse, being the brightest star in the constellation of Orion the hunter, is called Alpha Orionis. Rigel, the second brightest star in Orion, is called Beta Orionis. Bellatrix is Gamma Orionis and so on. The great majority of stars have no names at all but are cataloged by numbers such as Wolf 726, 8 and BD plus 36 degrees 2147.

With so many stars to pick from, it is nevertheless natural that we should be most interested in those nearest at hand. A primitive navigator at Honolulu on Oahu would first try to reach the other nearby islands of the Hawaiian group—Maui, Molokai, and so on—before venturing farther across the broad Pacific. What holds for island hopping holds for star hopping.

The star nearest the earth (after the sun, of course) is Alpha Centauri, the brightest star in the constellation of Centaurus, and third brightest star in the heavens. However, the Centaurus is a southern constellation and Alpha Centauri never rises above the horizon for most of the United States; occasionally southern Texas and Florida get a glimpse of it low in the southern sky. Its distance from us is only about 4 light years, so it is not unreasonable to assume that a space craft will some day approach the speed of light. A voyage of six years—allowing extra time to go up to top speed and come

down from it—is not unreasonable when we remember that Magellan's ship the *Victoria* took three years to complete the first circumnavigation of the earth.

Alpha Centauri turns out to be a little on the complicated side. Actually it is a group of three stars so close together they appear as one. The closest of these by an interstellar hair is a faint telescopic star sometimes called Proxima Centauri. The second star of the Alpha Centauri trio is a moderately bright one quite different from our own sun. But by great good fortune the third in the group is almost a twin of the sun, a yellow G type star just a trifle smaller than Sol. Perhaps it is circled by another Venus, Mars, and Earth.

Next after Alpha Centauri comes a little atomic beacon in the northern hemisphere, Barnard's star, about 6 light years away. It is too faint to be seen by the naked eye, but it has the distinction of being the fastest moving star in the heavens. In 1,000 years it would appear to cross the visible sky. (Most stars are anything but sluggish; the sun itself and its planet family, including the earth, is moving through space at a pretty fast clip—12 miles every second toward a point in the constellation of Hercules.)

After Barnard's star and at distances around 11 light years we find three faint telescopic stars that are only catalog numbers. They are, in fact, the three stars already mentioned—Wolf 350, Luyten, and BD plus 36 degrees 2147.





all. D. Drake of the National Astronomy Observatory near Bank West Virginia, recently listened in on the radio coming from Tau Ceti and of the nearer stars. He might amid the cosmic static a pat series of pulses such as only once should be able to launch the first half dozen primes (divisible only by themselves and one) one two five seven eleven

Odd to think of "Seven come eleven!" being the password of intelligence

Because of its fanciful nature, Drake's investigation was named Project Ozma after the dazzlingly beautiful princess of Lyman Frank Baum's much loved Oz books.

But before Columbus sailed, the lands across the western sea were fanciful too



## Porpoise Rated Genius Among Animals

PORPOISE a sea going mammal bigger brain than man's is gaining recognition as a mental giant of the animal kingdom the National Geographic Society says

Scientists believe this small member of the whale family may be the world's smartest creature after the chimpanzee. Some speculate he might outrank the intellectual if an IQ test suitable for animals could be devised.

Average weight of a human is about 1300 grams or a little more than three pounds. The familiar porpoise more accurately known as the bottlenose dolphin has a brain weighing perhaps 1800 grams. The porpoise as a complex voice apparatus suggests that it might conceivably learn human speech. A captive bottlenose dolphin at Marineland Florida is re-

ported to have imitated a brain researcher's voice so well that his wife burst out laughing. Then the porpoise imitated her laughter.

The relative intellectual standing of various animals cannot be accurately assessed at present but most zoologists who have studied porpoises are deeply impressed both with the porpoise's ability to learn—almost incredibly fast on some tests—and the wide variety of its emotional responses and interests.

One practical joke enjoyed by captive porpoises is to push a helpless sea turtle around the tank. Porpoises like to balance objects on their heads and throw them to a visitor at a marine exhibit. A recent mistake of tossing a bone at a tank of porpoises "shook the face

## WOMEN SMOKERS WARNED ON CANCER OF MOUTH

A specialist in mouth cancer finds that it is more difficult to break women of the smoking habit than men, even when life is at stake

Women seem to have more of a compulsion to smoke, says Dr Walter W Dalitsch, who is a physician and dentist in the University of Illinois medical school

Dalitsch blames smoking for the rapid rise in oral cancer in women. Twenty years ago this kind of cancer was a curiosity to be exhibited at a medical meeting because of its rarity

But today there may be a case in many hospitals at any given time



In the University of Illinois hospital recently there were five such women patients

The 'day of reckoning' occurs after about 20 years of smoking he points out. Thus many more cases may be expected since a large segment of the female population has had this exposure

Indicative of the increase in mouth cancer are the figures at the University of Illinois hospital. In the period of 1944-48 there was one woman patient for every 10 men. In the 1954-58 period the proportion of women more than doubled

Dalitsch has found in general that

women are less heedful of advice less cooperative in carrying out orders in regard to ending smoking

Mouth cancer often can be prevented by self examination. An early symptom perhaps a pearly, leucoplakic, or precancerous symptom, is the presence of thickened white patches on the inner surfaces of the gums, tongue and also cracking of tissues, ulcers and pimples

Other standard symptoms are sores that won't heal or charred tissue when swallowing

## BRAIN CLOT DEvised TO DESTROY TUMOR

Ordinarily a clot in a brain is considered a fearful event in medicine. But two Washington D.C. surgeons have deliberately induced an artificial clot to destroy a brain tumor

Doctors Alfred J Luessenhop and William T Spence of Georgetown University devised a plan in the form of a plastic ball and inserted it into the main arterial channel of the brain. It came to rest in front of the tumor and blocked it from further nourishment

The patient was a 47-year

# gress

# DICINE



by Arthur J. Snider

A man who had fainting spells since childhood, a numbness in the right arm and leg, loss of some finger movement and a slight speech impairment because the tumor was obliterating vital parts of the brain of a 37-year-old man. Seven weeks after surgery, the patient's symptoms disappeared.

## DON'T MASK NATURE'S ALARMS, PHYSICIAN WARNS

Are you a symptom masker? You may be turning off your alarm bell.

The alkalies you take for heartburn or indigestion may be silencing the sentry trying to call your attention to an ulcer ready to bleed.

The chronic headache repeatedly blotted out by aspirin may be monitoring a high blood pressure or circulatory disorder even a tumor.

The motion sickness drugs may put you back on an even keel after a spell of dizziness or staggering but on the other hand these symptoms could have been signs. Keep your wits up because a virus infection is present.

Paragonic often stops persistent diarrhea but are you screening amoebic or other parasitic infection, ulcerative colitis or a malignancy?

Symptom maskers, says Dr. H. Ivan Sippy of the senior staff of Northwestern University medical school, not only can harm themselves but also confuse the physician who tries to make a diagnosis.

He points out that one of the first principles learned by a young doctor during his training is "Don't mask the symptoms."

In other words don't give the patient a pain stopping narcotic when an undiagnosed abdominal emergency is present. Suppressing pain and tenderness might give a false impression that the disease is subsiding when it might be progressing to a dangerous stage.

Doctor Sippy believes that fever is the most important of all symptoms to be watched for by the layman.

But it likewise is the most neglected.

Many times he points out, the doctor is frustrated during a tele-



phone report for illness when the patient cannot give an exact record of his temperature.

The physician must make a decision regarding a fever before it has been reduced by aspirin or other temperature lowering drugs.

Everyone, he adds, should use a thermometer, learn to use it accurately, and take

ture before telephoning his doctor for advice

A surprising number of otherwise intelligent people believe they can judge fever by the way they feel. A feeling of warmth is no indication of the presence of a fever. Dr Sippy says. It may only be a skin effect due to dilation of the capillary blood vessels.

While one should heed nature's warning signals, he should not fall into the habit of being a hypochondriac. The individuals who repeatedly telephone for medical advice for trifling symptoms may grossly exaggerate them to gain the doctor's anxious interest.

This only deludes the physician. Eventually says Dr Sippy, the physician becomes understandably skeptical. Sometime when the trouble is real, the doctor may himself innocently mask a genuine complaint with telephone advice rather than make his customary investigation.

#### **VIRAL THEORY FOR LEUKEMIA STRENGTHENED**

The theory that a virus may be the cause of acute human leukemia has been strengthened by studies on



volunteer prisoners who were inoculated with brain extract taken from patients who had just died of

The volunteers developed protective antibodies in their blood stream, just as if they were vaccinated.

Blood serum was then withdrawn from the volunteers and injected into mice who normally are highly vulnerable to leukemia. The antibodies in the blood protected the mice against the disease.

The work was carried out by Dr Steven O. Schwartz of the Hektoen Institute for Medical Research, Chicago. He believes this not only demonstrates in clear cut fashion the presence of virus in leukemia but also the likelihood that a vaccine may some day be developed for the disease.

Considerably more research must be done to purify the extract and positively identify the presence of the virus.

#### **ONE IN FIVE SCHOOL TEEN AGERS ARE SMOKERS**

Two out of three of American teen agers now believe there is some link between lung cancer and smoking. The Institute of Student Opinion finds in a poll on teen age smoking habits among 10,763 secondary school students.

The poll showed that 21 percent of students in junior and senior high schools smoke cigarettes. Twice as many boys smoke as girls.

About 13 percent of the boys who smoke consume one or more packs daily, as opposed to 6 percent of the girls. About 37 percent of the boy smokers consume less than a pack a week. About half of the girl smokers use less than a pack.

The poll found that 18.5 percent of the boys who smoked started on a regular basis at the age of 12 or under. Well over half started by age 16.

As for the girls, nearly 9 percent started regularly at age 12 or under.

The American Cancer Society contends that one of the best ways to combat the growing problem of lung cancer is to educate the public to stop smoking. The education could start at the teen age level, the ACS says.

For adults who will not or cannot give up the habit, Dr. Ernst L. Wynder of New York, a foe of smoking, makes these recommendations: 1. Smoke a cigarette low in tar content. 2. Don't smoke to the very butt end of the cigarette, for the second half contains twice as much tar as the first half. 3. Don't try to inhale too deeply. If you inhale deeply, 90 percent of the entire cigarette of the smoke is completely absorbed by your lungs.

#### PLURAL BIRTHS RELATIVELY UNCOMMON STATISTICS SHOW

What are the chances of a couple having twins? New statistics by the Metropolitan Life Insurance Company show they occur once in every 25 confinements. Triplets occur once in about 11,000 confinements and quadruplets once in about every 700,000. There were no quintuplets born in the years under survey (1951-57).

The likelihood that a confinement will result in a plural birth varies with the age of mother. The chances

are smallest for teen age mothers—6 per 1,000—and increase with advance in age to a maximum of about 16 per 1,000 at ages 35-39.

Frequency of plural births is greater for nonwhite than for white women.



Of the 27,700,000 confinements in the United States during the seven year period, less than 300,000 produced a plural birth in which at least one infant was born alive.

Multiple pregnancy can be diagnosed with almost 100 percent accuracy from the 20th to the 27th week of pregnancy by a "brain wave" machine, according to Dr. C. A. Novotny of the U. S. Naval Hospital, Portsmouth, Va.

Electrodes applied to the abdomen of expectant mothers permit a systematic search for fetal heart beats. The number of babies is indicated by the slight differences in beats.

#### NEW BODY SUBSTANCE FIGHTS VIRAL INFECTION

A substance that is released by the cells when it is invaded by a virus might be concentrated and used against local virus infections, such as a cold, in the belief of Dr. Allick Isaacs of the National Institute for Medical Research.

The substance is called interferon. The virus infected

protect themselves with interferon particles but also confer resistance on other cells. Interferon may be the reason many people have natural immunity to viruses all about us.

Doctor Isaacs, who discovered interferon, says it is not linked to any one virus. It is produced by cells in response to invasion by many types of viruses and is apparently effective against all of them.

Interferon is simple to obtain, says the researcher. It can be produced from inactivated influenza viruses, fowl plague, Newcastle disease, measles and poliomyelitis.

Unlike vaccination, which prevents disease from occurring, interferon is apparently active once virus infections are already started in the body.

#### **HUMAN POLIO VIRUS SEEN INSIDE CELL FOR FIRST TIME**

For the first time, polio viruses have been seen and photographed inside the human cell in which they were formed.



Hitherto, human polio viruses have been seen under the electron microscope in isolated and concentrated form outside the cell.

Doctor D. C. Stuart Jr., working under an American Cancer Society grant in the New York State Department of Health Laboratories in Al-

bany, has found that the viruses are formed in the cytoplasm surrounding the nucleus and not in the nucleus itself, as has been supposed.

He also discovered that an enormous number of viruses—some on the order of 100,000—are produced in a single cell in a few hours. The polio viruses are so small that 100,000 of them occupy about one or two percent of the volume. Polio virus is one of the smallest agents known to infect man. It would take almost a million of them side by side to fill an inch.

Doctor Jorden Fogh, also working with Dr. Stuart, cultured cells of human amnion, the lining of the placenta that nourishes and protects the fetus. They added polio viruses to these cultures, sliced the cells as one would slice a loaf of bread, and made electron micrographs of how the viruses behaved within the cells.

#### **WOMEN LIE ABOUT AGE? IT'S A LIE STUDY FINDS**

In New York, a Staten Island physician asked 151 men and women, "How old are you?"

The men lied more often than the women, dispelling the legend that women do not tell the truth about their age, says Dr. Nathan Wasserman in the *Journal of the American Geriatrics Society*.

Lying occurred more frequently in the middle age group—30 to 49 years—with the male sex preponderating in the overall percentage of liars.

**R**AIN FOREST' and 'jungle' are frequently taken to mean the same thing. But I have never liked the word jungle. It has all the wrong connotations. You hack your way painfully through the lush vegetation of the jungle dripping sweat in the steam bath atmosphere. snakes hang from trees and lurk under foot. leopards crouch on almost every branch and there is always a tiger just beyond the impenetrable screen of foliage. There are hordes of biting stinging and burning things. The jungle is green hell.

The true rain forest untouched almost untrodden by man is open carpeted with the richly variegated browns of many different kinds of fallen leaves sometimes brightly spotted with blue or red or yellow from flowers that have fallen from unseen heights above.

The carpeting is thin easily scuffed away to show the red lateritic (rock decay) clay soil so characteristic of the equatorial regions. There is no thick accumulation of leaf mold.

## Exploring the Rain Forest

*by Marston Bates*

Condensed from a chapter of the book  
*The Forest and The Sea*



like that of northern forests, no rich accumulation of humus. The processes of decay are too fast to permit much organic accumulation in the soil.

There is little vegetation on the forest floor since the light is too dim for plants. There is a thin growth of tree seedlings (which have no chance to grow unless some catastrophe to a forest giant should open space), ferns, sometimes dwarf palms, or scattered thickets of huge leaved aroids (herbs), the sort of plants that also grow well in the dim light of hotel lobbies.

But basically the forest floor is open, with vistas of a hundred feet or more, vistas framed and closed by the straight trunks of the trees that disappear into the vaulted green canopy that they support above.

The cliché often used for the forest is "cathedral like." The comparison is inevitable: the cool dim light, the utter stillness, the massive grandeur of the trunks of forest giants, often supported by great buttresses and interspersed with the straight, clean columns of palms and smaller trees, the gothic detail of the thick, richly carved woody lianas (climbing plants) plastered against the trunks or looping down from the canopy above.

Awe and wonder come easily in the forest, sometimes exultation—sometimes for a man alone there, fear. Man is out of scale: the forest is too vast, too impersonal, too variegated, too deeply shadowed. Here

man needs his fellow man for surance.

The rain forest is truly a silent world than the. The wind scarcely penetrates not only silent, it is still. All then gains a curiously mystery. A sudden crack could have made it? An inexplicable gurgle. A single clear peal—it was a bird, probably a trogon whistle, impossible to identify in mostly silence.

The silence sometimes becomes infectious, I remember sometimes trying to blend into this world by crawling along a trail without rustling a leaf with my feet or popping a twig. But more often I purposely scuffed, broke noisily through this where I didn't belong, tried to advertise my presence both to reassure myself and to warn the creature in the forest that a stranger was there—I had no desire to surprise a de lance (large venomous serpent).

Perhaps I am making the forest sound too easy, too open, too cathedral like, overdoing my rebellion against the idea of jungle. It is difficult to give an objective description to convey an accurate impression of a landscape like the rain forest. It may in one person, arouse awe and wonder, and in another, fear and hatred.

I doubt whether the rain forest anywhere easy to penetrate for great distance. There are always obstructions: occasional fallen sudden tangled thickets and all stretches of swamps and less streams.

Sometimes the streams are small, narrow, shallow sandy brooks, looking different from the forest brooks of New England, and easily negotiated. But sometimes they are broad rivers, sometimes they move sluggishly over bottomless mud, sometimes they are choked with impenetrable masses of fantastic vegetation. The green hell analogy becomes justified enough in these forest swamps. They are the reason that man has had so little success in making trails and roads through the forests. Why he clings to the major rivers either for exploration or trade.

### Three Major Forests

There are three major areas of tropical rain forest: the American, the African and the Indo Malayan. They cover all of the land masses crossed by the equator except the west coast of Africa.

The American forest is by far the largest and most continuous cover, most of the Amazon drainage in central South America and extends south on the inner side of the Andes in Bolivia into the drainage of the Plata and north in Colombia into the drainage of the Orinoco. It is hardly separated by the northernmost ranges of the Andes from a Pacific strip that follows the coast from Ecuador to Panama and

continues, in Central America, along the Caribbean coast almost to the line of the Tropic of Cancer in Mexico.

There is an isolated stretch of rain forest along the southern coast of Brazil and rain forest once covered much of the West Indies though now there are only scattered remnants.

The African rain forest is the smallest of the three and there is considerable debate both about its present limits and its former extension. It covers essentially the central drainage of the Congo with a north and west extension along the gulf of Guinea to Liberia.

The Indo Malayan rain forest is the most fragmented. It covers most of the large islands of the East Indies—Sumatra, Borneo, Celebes, New Guinea, the Philippines—and the Malay peninsula with outlying areas on the west coast of India, in Burma on the coast of Indochina, and along the coast of northern Queensland in Australia.

In structure and appearance, the forests of the three areas are very much alike. The taller trees reach a height averaging about 150 feet, though individual trees more than 200 feet in height are not uncommon. The tallest reported rain forest trees are somewhat less than 300 feet. Rain forest trees are thus in general taller than trees in the temperate forests of Europe or America where the average trees in the least disturbed forest are around 100 feet with a few exceptional heights.

Mr. Bates, zoologist, author and lecturer at the University of Chicago. The distinguished author of *The Natural History of Mr. Bates' Book is The Forest and the Sea* in which this excerpt is contained.

But trees in the tropical forest do not reach the gigantic proportions of the California redwoods or the Australian eucalyptuses. The tallest measured sequoias reach 364 feet, the tallest eucalyptuses 350 feet.

### **Insect Life**

The rain forest crawls with ants of many different kinds occupied with many sorts of business. Close associations between particular kinds of plants and particular species of ants are quite frequent.

Sometimes the ants clearly serve to protect the plants that provide them with nesting sites in hollow stems. One learns to avoid brushing against the trunks or foliage of certain trees like *Cecropia* with the same care that one learns to avoid poison ivy or poison oak in more northern situations. With the ant-protected trees the fiery consequences of transgression are immediate as well as painful.

The ants are one example of the incredible abundance of insects in the rain forest. It is an abundance of kinds rather than of individuals. Within a range of about ten miles of our laboratory in Colombia we found 150 different species of mosquitoes (there are only 121 species known from all of the United States and Canada). But you may get more mosquito bites in northern woods than in tropical forests. In northern woods the mosquitoes biting you are apt to be all the same kind, while in the rain forest, almost every bite will be from a different kind of mosquito.

The structure of the rain forest and the appearance of its inhabitants is much the same in America, Africa and Indonesia, but the three areas have had independent evolutionary histories and are made up of quite different kinds of plants and animals.

The only animal I can think of (besides man) common to all the regions is the leopard which is hardly distinguishable from the jaguar of the New World. But though the big cats are at home in the rain forest they are far from restricted to it, or to the tropics either.

Thus we find great apes in both the African and Indo-Malayan forests: gorillas and chimpanzees in the former and orangs and gibbons in the latter, but no great apes in tropical America. There are monkeys in all three regions but the American monkeys belong to quite different families from the Old World monkeys and have had a separate evolutionary history for a very long time.

### **Animal Life**

Among the rain forest animals there are many survivors from geological past. We tend to think of marsupials as primitive mammals that have survived and proliferated in the isolation of the Australian continent except for the common and tough opossum of North America. But in the tropical rain forest, there are dozens of kinds of marsupials. They are not as spectacular as the kangaroos and their relatives of Australia but they are interesting enough.

here is a sleek water opossum (cronectes) living on the margins of forest streams a bright eyed opossum (Caluromys) with y, thick fur, and many different species of tiny mouse like opos (Marmosa) as well as several r genera

be sloths are another archaic p (and they look it) now con l to the trees of the American forest, though in the recent ge ical past there were also many b of ground sloths

is in the rain forest that jungle reigns supreme the struggle existence nature red in tooth and Here we find the most fantas

he struggle for existence is sym ed by the strangling fig which is out as an epiphyte a seedling

is a bothered by the encircling which then stands alone and I can think of nothing more astatingly fierce more irresist than a horde of army ants on move killing and dismembering n animal they encounter that not fly away or run fast enough

### Survivors from the Past

Life then can be grim enough for forest inhabitants Only the ver the carefully protected the tremely prolific the most modern em to have any chance of sur

vival Yet, scuttling through the leaves of the forest floor, and nest lung in the debris collected around the roots of epiphytes high in the trees, are scores of kinds of cock roaches hardly different in any way that we can see from the fossils of their ancestors that lived three hundred million years ago in the forests of the Carboniferous (early Paleozoic) period

Push over a rotting log and you may very well find a Peripatus a soft brown delicate multilegged caterpillar like thing that, on examination turns out to be a very queer creature indeed

The ancestors of all the land arthropods of the millipedes centipedes spiders insects the first animals to learn to live on land must have been something like this But this anachronism is still getting on very well in the warm damp world of the forest meeting—as far as we can see—unchanged the shifting hazards in hundreds of millions of years of forest life

But with all these reservations and qualifications the rain forest still seems to have more than its fair share of survivors from the past

One can visualize the struggle for survival the competition the strenuousness of life in the rain forest But then in the next instant looking at the multitudinous accumulation of organisms one gets the feel that there is so much warmth much light so much moisture much food that almost anything survive and that almost everything does



After the third decade the production of male hormones gradually declines

## The Male Menopause

by Harold Shryock M.D.

Condensed from *Life and Health*

MR WILLIAM T. SIMPSON (T stands for Tired) came to the doctor's office and slumped into a chair in the consultation room. The doctor had known Mr S. for several years and was surprised that he was feeling ill. He was a successful businessman who had done a good job of rearing his children. He had reached his early 50s but just now he appeared older.

'What seems to be the trouble?' the doctor asked after exchanging a few pleasantries.

'Well, Doctor, I have no reason to feel sad but it's hard to control

my feelings. Things bother me more than they should. I get cross with my family and feel irritable. I'm at work. I don't have the energy I used to have. Even though I'm tired in the evening, I have trouble sleeping at night. Sometimes I get headaches.

'What bothers me most is that I don't think as clearly as I should and it's hard to remember. I've always taken good care of my business affairs but lately the business has been pushing me. It's hard for me to take and sometimes I feel depressed.'

'If you were a woman,' replied the doctor, 'I would think you

g through the change of life  
 urse some men have a com  
 e experience

u know said Mr S I was  
 ung to think the same thing  
 least I don't have hot flashes  
 ve yourself time commented  
 doctor You may still have

I'll examine you to see  
 er I have assumed correctly  
 doctor gave Mr S a careful  
 al examination and sent a  
 en of urine to the laboratory  
 special test to determine how  
 sex hormone his body was pro

ew days later Mr S returned  
 doctor's office to hear the out  
 of his examination

examined you carefully the  
 began and did not find any  
 e disease that could cause you  
 the way you do The labora  
 st I ordered was not as conclu  
 I wish it were but it suggests  
 our glands are not producing  
 usual amount of male hormone  
 ext thing is to try some syn  
 hormone to see whether it will  
 e your symptoms

another month Mr S came  
 to report I am feeling a lot  
 doctor he said but I have  
 questions I want you to an  
 Do all men pass through this  
 ence? You spoke of my glands  
 being less sex hormone What  
 is this? If my glands are not

hit me harder than it hits some other  
 men? Some men remain active and  
 retain their virility until they are 70  
 or 80 years old What's the matter  
 with me?

AS THE DOCTOR tilted back in his  
 chair he admitted these ques  
 tions were pertinent He discussed  
 them one at a time

First your question on whether  
 all men pass through an experience  
 like yours It is recognized that the  
 male sex glands reach their peak of  
 activity about the third decade of  
 life Beyond this age there is a grad  
 ual falling off in the production of  
 male hormones But the rate at  
 which the male glands slow down  
 their functions and the suddenness  
 with which this slowdown occurs  
 vary a great deal from one man to  
 another

Many men do not have the  
 marked symptoms you have been  
 having but all men have a progres  
 sive decline in the function of their  
 sex glands In many cases this de  
 cline is so gradual that the symp  
 toms if they occur at all are not  
 troublesome

Even though the function of the  
 male sex glands tapers off with ad  
 vancing years it usually does not de  
 cline suddenly As for the reproduc  
 tive function many men have be  
 come fathers after they have passed  
 70 or 80 years

In the average man the decline  
 in function of the sex organs is  
 gradual that the other organs of  
 body make the necessary adjust  
 without allowing symptoms to

life? Why did this thing

velop. In the cases where the decline of the sex glands occurs more suddenly, symptoms appear that closely resemble those a woman experiences under the same circumstances." The doctor paused for a moment, then continued:

When symptoms occur in men they occur typically at a slightly older age than the age at which the change of life occurs in women. Symptoms of the male climacteric usually occur between the ages of 48 and 52. These are average figures. In individual cases the symptoms may occur earlier or later.

The testes — male sex glands — have two principal functions: to produce sex cells and to produce sex hormones. A sex cell is the tiny biologic unit capable of uniting with a comparable female cell to establish the life of a new individual. The male sex hormones are chemical substances that circulate throughout a man's body and stimulate his various tissues in harmony with the general pattern for masculine characteristics.

Mr. S. did not take his eyes off the doctor's face.

Although sex cells and the sex hormones are produced in the same glands, they are not necessarily dependent on each other. The physician went on: "The male sex glands may continue to produce the male hormone even after the production of sex cells has stopped. The production of male hormone may decline rather sharply without interfering with the production of sex

"It is possible for a man to become a father even after he has passed through the male climacteric. This is quite different from the situation that obtains in women, for it is not possible for a woman to become a mother after her change is complete, which is about two years after cessation of the menses.

"One of the normal effects of the male hormone in a man's body is to give him the drive, courage and aggressiveness typical of young manhood. A sudden reduction in the amount of male hormone subtracts from a man's personality the characteristics that are typically masculine.

This change does not affect intellectual capacity, but it tends to reduce his drive and courage. When a man understands this, he naturally becomes anxious and even aggressive. The doctor smiled understandingly.

He worries because he does not feel as aggressive as he formerly did. With reduced drive, it is difficult for him to maintain his usual pace. He may feel that he is losing his grip on his business affairs just because he does not prosecute these affairs with his former vigor. He may become concerned for fear of losing his masculinity. He rebels against his forced slowdown.

It is being thwarted that counts for most of the symptoms of the male climacteric. The final remedy consists of helping the man become reconciled to his new station in life. It is an undeniable fact that a man cannot stay young forever. He is wise when

pt this fact gracefully and can  
ern his activities and attitudes  
rdingly'

Mr S nodded slowly

THE SYNTHETIC MALE HORMONE  
often prescribed to help a man  
th symptoms of the male climac  
ic is only an adjunct. It cannot  
store his youth. It cannot reduce  
e number of birthdays that have  
ssed. What the synthetic hormone  
es for a man is ease the shock of  
e changing status. It tides him  
er for a few months while he is  
doing the necessary personal ad  
justments to the slower pace. The  
e of synthetic hormone need not  
d should not be continued for long  
ods," the doctor said emphati  
cally.

"Well doctor," Mr S responded  
ou have done a good job of an  
swering my questions. Naturally I  
s, 14 -

"It depends on becoming  
conciled to acting my age."

"That's right," said the doctor  
smiling, "but I would not want you  
to feel for a moment that the best  
part of life has passed. We might  
say that life consists of three phases  
— childhood, parenthood and full  
maturity. You are in the transition  
between parenthood and full matu  
rity. Many of the better things of  
life lie ahead. You are in a position  
to realize the satisfactions and re  
wards toward which you have  
worked during the more active  
period of your life.

"Life's greatest treasures such as  
companionship and the appreciation  
of cultural and spiritual values will  
mean more and more to you. In spite  
of slowing down your activities in a  
sensible way the contribution you  
are making within your family, your  
business, and the community will be  
come significant as you continue to  
build on the advantages you have  
gained in life."

### Strong Plastics Used to Repair Roads

REPAIRS TO CONCRETE California high  
ways are being made with plastics so  
strong they hold even when the con  
crete itself breaks.

Bailey Tremper, supervising mate  
rials and research engineer for the  
California Division of Highways said  
that epoxy resins form strong chem  
ically resistant structures having re  
markable adhesive properties. A re  
sult of chemistry, the resins

have long crosslinked molecules that  
provide great strength.

Tremper said his division as far as  
is known first discovered "that epoxy  
adhesives will form a strong durable  
bond between fresh plastic concrete  
and old hardened concrete."

He said California installatio  
proved the durability of the  
areas of mild weather.



## Have Coins Ready—



## Pay-TV's Coming!

by Hal Morris

**P**AY TELEVISION, caught in a log jam of pros and cons plus technical difficulties appears to be making a breakthrough after more than a decade of planning and occasional tests.

If all goes well the current citizens' reception of toll television in the Toronto Canada, suburb of Etobicoke will spread to such places as Hartford Connecticut Rego Park Long Island New York and resume at Bartlesville Oklahoma, year's end.

In addition, there's growing interest for subscription television in other areas—Texas, Pennsylvania Wisconsin, Florida and Michigan.

Its leading proponents claim television has arrived and nothing can stop its progress.

Motion pictures not available on regular TV, stage shows operas ballets, recitals symphonies and sporting events are among pay TV's planned offerings.

Aside from certain personal and economic benefits pay TV's current revival undoubtedly is boosted by charges of quiz show rigging payola the mediocrity of many free TV programs with too much emphasis on crime and western shows, plus irritating commercials.

What are the features lifting pay TV?

Comments from Etobicoke

ing a first run motion picture without having to stay up for the late hour movie shows on free television.

2 Clarity of the picture good except on and absence of commercials are lauded. Superior pictures achieved by using larger projectors than those commonly used by television stations. Land line reception contains no atmospheric interference on the audio or video end no 'snow' or ghosts.

3 Most families find pay TV a pleasant and economical solution viewing a top feature at a low price—and without a babysitting fee.

he Etobicoke operation is backed by companies connected with the industry Paramount Pictures through its wholly owned TV subsidiary, International Telemeter Corp. franchised Famous Players Canadian Corp. Ltd. Canada's biggest theater chain Famous Players is half owned by Paramount. The same movies seen in Famous Players owned theaters in Etobicoke are viewed on pay TV there. The films are secured by the pay TV which is the holder on the same basis as movies to theaters—on a percent deal.

The Canadian toll television set is unlike previous U.S. tryouts in that it stresses president Louis F. Brown of Telemeter which has led pay TV development in 1950. He is digesting the idea for a year. Etobicoke is considered an ideal testing ground. There is plenty of competition from free TV. Residents can receive five stations in the area. Two affiliates of U.S. networks. Telemeter's Etobicoke operations have 1,500 subscribers signed by mid-1951 with 5,000 to 10,000 expected by June 1. The 93 mile long cable is being laid by 13,000 homes. Telemeter is to lay cable in an adjoining Toronto area which would make pay TV available to 40,000 homes.

In the first month of Etobicoke operations this year, Telemeter piped out 19 first run movies that were screened 140 times four hockey games one boxing match and several movie shows for children.

Telemeter figures 75 percent of the viewing hours eventually will feature movies 15 percent sports and 10 percent opera ballet and theater.

### Plan Long Island Test

Reintroduction of Telemeter in the U.S. (it was tested in Palm Springs California in 1953) will be on a larger scale than the Canadian operation. While the Etobicoke debut was made in about 1,000 homes, it is planned to wire between 10,000 and 20,000 homes initially in Rego Park Long Island New York.

Within a half mile area surveyed in Rego Park reports Telemeter's Paul MacNamara there are 20,000 TV sets. We're aiming to hook up half that number. It would be easy to grow TV sets in apartment houses are connected to a master antenna. All we'd do is tap the master and we're in business.

Meanwhile Zenith Radio Corp. and RKO General Inc. have teamed and plan a three-year trial run of Zenith's over-the-air Phonovision system in Hartford Connecticut.

Zenith made a limited test of pay TV in 300 Chicago homes nine years ago.

While stringing wires to homes—as with Telemeter—consuming the Phonovision could come into 3

MORRIS, a Los Angeles Mirror staffer specializes in articles dealing with the technical and business end of business.

served by station WHCT (Channel 18) Hartford, without need of cable.

Extensive field tests, Zenith says, have been completed on a decoder that unscrambles transmitted sound and picture. A simple device, the size of a table model radio, the decoder is attached to the subscriber's TV receiver.

The Hartford trial run will seek to prove stations not affiliated with networks can operate profitably if they are permitted to engage in subscription programming.

Several other pay TV methods, dormant for a few years also may spring to life again—Blonder Tongue Laboratories Inc. Tele Globe Pay TV System Inc. and Skiatron Electronics & Television Corp.

Zenith and Skiatron favor wireless rather than cable TV such as Telemeter. But all three claim they can adapt their systems to either wired or over the air methods.



Copper cables are expensive to install and cost of each Telemeter box, manufactured by Guardian Electric Co. Chicago is slightly over \$60 for the Ft. St. Vrain operation where 100 to 125 are installed every day. U.S. systems will use newer models that will carry lower price tags of about \$50.

Under Zenith's proposed Phonevision setup in Hartford via station WHCT, a few evening hours each would be devoted to subscrip-

tion service, other programs through the station would be regular free. Each month the subscriber will get a program guide of pay TV shows mostly major box office attractions not seen on regular TV.

### Flip a Switch

To see a Phonevision program pay viewer flips a switch on the coder mounted on the TV set. Electronic tape keeps a record of what is viewed for monthly bill. However, the subscriber can pay as he sees by putting coin slot on the decoder.

In the Telemeter wired system signals for three different programs leave a main studio on a single cable. As a signal passes along cable route it is amplified at various points to compensate for loss of strength the result of cable resistance. Booster amplifiers installed atop utility poles restore the signal to peak performance.

Feeder lines attached to utility poles fan out through residential areas and individual homes linked to the system via drop lines along the way.

A drop off connection is clipped to the feeder cable outside the dwelling. Circuit elements within the tap off unit isolate signals entering the house so there is no possibility of interference between subscribers' programs and another.

The drop off wire is connected to a wall plate similar to those used by utility companies when installing telephone or electric lines then attached in 10 minutes to the TV

unit through an external connection to antenna terminals on the back of the TV set. The telemeter asks a \$5 installation fee for its coin boxes. Program costs range from a nickel to \$2. Boxes accept nickels, dimes, quarters and dollars. In case of overpayment, a storage indicator automatically provides a piggy bank for the program payments.

When a subscriber pays for a program, his TV screen remains blank. Upon payment of the coin, the program appears. As the television a tape recording automatically identifies all programs viewed. This recording is collected along with the cash every 30 days by a system representative. The collector also provides maintenance.

### Cost of System

What are the costs of a pay TV system? What is needed to set it up? Wired versions, studio equipment is obtainable from several manufacturers. Price varies depending on many factors including size of either 16 millimeter or 35 millimeter projectors. Basically, a studio providing two simultaneous film programs utilizing 16 mm projectors and including equipment for originating one live program plus gear to feed programs to a remote point costs \$56,000. A distribution system including cable installation and feeder lines covering residential areas as well as drop-offs (connections from cable outside dwellings) to

5,000 homes under normal circumstances is estimated at \$200,000.

The Telemeter box attachments at \$60 each add \$300,000 more for 5,000 subscribers.

Thus basic cost for a 5,000 unit service of pay TV via cable comes to \$556,000. In addition there are housing and land costs for the studio.



The over-the-air method necessitates buying or teaming up with an existing TV station. Service technicians and installation of decoders are other chief expenses.

Subscribers' method of payment is important. The September 4, 1957 to June 6, 1958 cable TV test at Bartlesville, Oklahoma, by Video Independent Theatres Inc. flopped in part because of a flat charge initially of \$9.50 a month for 13 first-run movies and 17 not so recent features. Later the monthly rate was sliced to \$4.95 and showings were curtailed as subscribers dwindled.

But Bartlesville toll TV operations are far from dead. About 800 homes remain wired for pay TV in the community of 8,000 TV set owners. Video Independent Theatres president Henry Griffing already has plans to resume pay TV this time using the Telemeter pay-as-you-see system. He figures Telemeter's cash method will solve problems he encountered in the earlier trial.

More than 500 U.S. communities hemmed in by mountainous terrain factors receive TV

community antenna systems. Each is a potential pay TV area.

But final success of pay TV won't be without hurdles. An entertainment world war is possible.

There is an abundance of pressure and anti pay TV talk from theater operators, television networks and other groups.

The networks claim pay TV will engulf competing forms of entertainment, luring away the customers and talent—and at prime evening viewing hours. The public would be robbed of free air waves they say.

The National Association of Radio and Television Broadcasters terms pay TV "a promoter's dream which could become a public nightmare."

National Broadcasting Co. chairman Robert W. Sarnoff stated: "If pay TV progressively siphoned off our key attractions, we would lose one of our only means of holding a mass audience."

Advertising effectiveness would be reduced. Integrated revenues would shrink. The development of new programs, the continuation of public service programs, would be hampered.

Coaxial cables for cable television are still a high cost of entertainment in American life. They are manufactured by RCA, General Electric, and

mount Theaters, Inc. television would "eventually mean the destruction of free television." He adds: "Nor is there any way that pay television programs can be carried without carrying advertising."

On this point Golden has been sensitive to the fact that pay TV is the most talked of pay TV as the medium without commercial provisions for sponsored programs.

### No Commercials?

Telemeter, in a brochure aimed at attracting pay TV operators, lists several features suitable for operation by local business concerns: news, weather and time.

Strongly against toll TV, Theater Owners of America, Harry Harling, assistant to the president, declares: "If pay TV were ever introduced on a broad scale in this country, thousands of theaters would be put out of business before pay TV itself was proved uneconomical."

Such are the forces for and against subscription television.

Survival or doom of pay TV in this changing social and economic world rests with the viewer and the Householder.

unit through an external connection to antenna terminals on the roof of the TV set.

The meter asks a \$5 installation fee for its coin boxes. Program costs range from a nickel to \$7. Boxes take nickels, dimes, quarters and dollars. In case of overpayment, a storage indicator automatically provides a piggy bank for program payments.

Until a subscriber pays for a program, his TV screen remains blank. Upon payment of the coin, the program appears. As the movie is on a tape recording, it automatically identifies all programs used. This recording is collected along with the cash every 30 days by a system representative. The collector also provides maintenance.

### System

What are the costs of a pay TV system? What is needed to set it up? There are three versions: studio equipment, obtainable from several manufacturers; Price varies depending on many factors including whether 16 millimeter or 35 millimeter projectors; or a studio providing two or three film programs utilizing projectors and including equipment for originating on plus gear to feed program to remote point costs \$10,000. Distribution system is a cable installation at each residence. In residential areas, wiring is done by drop-offs (connections from main lines outside dwellings).

5,000 homes under normal circumstances is estimated at \$200,000.

The Telemeter box attachment is at \$60 each and \$15,000 more for 5,000 subscribers.

Thus basic cost for a 5,000 unit service of pay TV via cable comes to \$356,000. In addition there are housing and land costs for the studio.



The over the air method necessitates buying or teaming up with an existing TV station. Service technicians and installation of decoders are other chief expenses.

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homes remain wired bases for these discussions. To answer the question we must first understand the causes of the evolution in any plant or animal. Biological scientists have a widely accepted well-founded theory concerning the animals of evolution in the biological world called the theory of selection. It was first proposed in 1859 by Charles Darwin. Natural selection is

sifting or culling process acting continuously on plant and animal populations. It depends on the simple fact that all such populations contain a wide variety of individual types. If a species finds itself faced with a changing environment which makes new demands, some of these individuals will be better able than others to meet the new circumstances.

These individuals, having survived in greater numbers, reproduce the particular characteristics that gave them their advantage. Their offspring in turn will have the same advantage over their contemporaries and will contribute an even greater proportional share of these advantages to the succeeding generation. The net effect is a gradual change in the composition of the entire population.

This phenomenon might be called adaptive adjustment. It might appear that such a process could not produce such dramatic evolutionary changes as from fish to philosopher as Homer Smith put it, but it does appear that one adaptive adjustment can open the door to another. And operating over millions of generations and hundreds of such adjustments, there is no limit to the change which might be brought forth. For example, let us make a somewhat hypothetical reconstruction of one of the critical phases of man's evolutionary history.

Two of the most important changes in human evolution were

(1) the change involved in becoming an erect bipedal ground walking animal and (2) enormous brain development. To reconstruct the first of these, let us look at man's tree dwelling ancestor living in the forested regions 10 to 15 million years ago. Climate was undergoing an extremely slow change toward aridity and the forest was slowly giving away to grasslands.

With the trees disappearing, the animals were faced with the problem of surviving on the ground. At first it was merely a matter of getting from one patch of forest to another. Gradually the need for food forced them to the ground and balanced somewhat precariously on their feet they moved awkwardly between trees, often scrambling after rodents for dinner. Some of the individuals were endowed with more anatomical characteristics of bone, joint and muscle which allowed them to move about more easily than others.

**B**Y BEING ABLE to move faster to escape the saber-toothed tiger and to catch more food, these individuals had a slight statistical advantage over their fellows in the game of survival. More of them lived to reproduce. Consequently, they contributed more than their share to the following generations.

This went on generation after generation, slowly producing a change in the entire population. Tens of thousands of generations of continual selection finally produced a bipedal ground-dwelling animal with

the longer legs, shorter arms, and hips remodeled so he could stand relaxed and well balanced and flat, remodeled feet on which to stand.

Having demonstrated the concept of natural selection, let's re-examine our predictions as to the future of evolution. For instance, will man lose his wisdom teeth?

Some individuals are born without wisdom teeth, but is it likely that they have a greater chance of survival and reproducing than people with them? Are toeless babies more likely to grow up and reproduce than those born with toes?

Darwinian predictions such as these are based on various misconceptions of the mechanisms of evolution. For instance, the prediction that man's muscles will wither comes from the old theory that characteristics acquired during the life of an individual become hereditary and are passed along to his offspring. For example, if a man does strenuous work and his muscles grow, his son will be born with withered muscles. Lamarckianism as this

theory is called, has been for some time completely discarded. Another misconception concerns the notion of a "perfecting principle" in evolution. Anthropologists have found that the remodeling of man's skull has continued in the expansion of his

brain caused a shortening of the jaw, which in turn accounts for our present-day wisdom tooth trouble.

Some have suggested that evolution will take care of this problem by removing the wisdom teeth entirely. This probably stems from an old idea that the evolutionary process is some sort of change toward "perfection."

Actually, the achievement of efficiency and balance has been a matter of survival rather than evolution of the perfect for the sake of perfection.

The matter of wisdom teeth serves to illustrate the new relationship man has established with his environment. Under primitive conditions an infected wisdom tooth was often a matter of life or death, and it is quite possible that we were on the way to losing them by natural selection. Now, however, with both penicillin and dentists, the infected tooth is no longer so important, and the dentist, by removing it, also removes the force of selection.

In the future, the environment of modern civilization is completely different from the environment in which almost all the man's past evolution took place—the five to ten million years before the dawn of civilization.

ALL ANATOMICAL DETAILS which separate man from the great apes were shaped and molded by selective forces of his primitive environment. Such matters as the ability to run or hurl a spear,

by TIMOTHY PROUT, assistant professor of zoology at the University of California, Riverside branch. This article is a condensation of a popular lecture given by Dr. Prout.



stalking wild animals, ingenuity in fashioning spear heads were of great importance to survival

Modern civilization, by comparison, may be looked upon as a protective cloak thrown around most of mankind, removing it for the most part from the particular selective forces of primitive life

Let us next consider the effects of the relation of selection which the new environment has brought about. Some have suggested that because of this relaxation man as a species will go soft and deleterious traits will spread throughout our population. But the Hardy Weinberg law stating the fundamental principle of population genetics indicates otherwise

This law says that a trait which is neither advantageous nor disadvantageous to its possessor—neutral in a Darwinian sense—will neither increase nor decrease in incidence from one generation to the next. In other words if we consider the descendants of normal people beside the descendants of a feeble minded individual we find that the whole population is growing but the ratio of feeble-minded to normal has not changed at all

The question then is has man's new environment of civilization brought with it new selective forces? To answer this question we need to know what physical and mental characteristics have the highest combined survival and reproductive rates? Next we have to know to what extent such traits are hereditary

Finally we have to know the

persistence of their selective advantage. Such information might give us an idea of where man is going.

Unfortunately, of all the studies made by sociologists, anthropologists, politicians and the tooth and cigarette people, none gives the information we need. Still there is one trait which has been analyzed in terms which are useful and that is intelligence as measured by the known IQ test

Intelligence is one of the most interesting and confusing traits where the influences of hereditary and environmental differences between individuals are about equally important. There are hereditary tendencies toward high and low intelligence but the extent to which these are expressed depends to a great extent on such factors as family environment and schooling

There are those however who say the average IQ of the population is dropping because (1) There are small average differences in IQ between different social and economic levels and (2) Lower economic groups tend to have larger families

There are a number of factors which may be working against an effect

First of all the inverse relationship of IQ to reproductive rate is a recent phenomenon not universal and some sociologists believe it is shortlived

Second people with a high birth rate do not have a high mortality

Thirdly, and most important, natural selection can only operate

tary differences since it depends on the multiplication of particular traits in the offspring. Hereditarily plays a part in determining intelligence but it does not mean that if two groups differ in average IQ they differ because of hereditary endowments.

It is probable that total IQ differences between lower and higher social groups are due principally to environment and schooling. That average hereditary endowments found in different social groups are the same. If so, as seems likely, the differential reproductive rates will have no effect whatsoever on the changing composition of succeeding generations with respect to IQ.

Coming back to the initial question, if evolution stopped it can be said that man's new environment in the biological world has not completely erased the selective forces that act on other animals. The complexity and novelty of the environment in the biological world makes it impossible to guess what new selective forces it has brought with it.

In spite of my inability to make a definite prognostication I would like to make a broad generalization. We have already noted the protective effect of man's new environment. The fact that he can live quite comfortably on the South Pole at the equator in the jungle on the desert beside the sea and for short periods even in the air or under

In each case he uses his intelligence and knowledge to protect

himself from these variations in environment.

To me this means that if man is subjected to a new environment in the future (the usual stimulus for evolutionary change) he will use his knowledge and ingenuity to adapt to it rather than undergo bodily evolutionary changes through the process of natural selection. To put it crudely, if the world grew cold (say we entered an ice age) man would put on a fur coat rather than evolve one. Thus the man inside the coat would remain the same.

Forced to make a prediction I would say man has reached an environmental relationship tending to produce evolutionary conservatism.

Evolutionary conservatism and even stagnation are not without precedent in the biological world. The opossum has remained essentially unchanged for the last 80 million years while changes were taking place in his mammalian relatives. At the beginning of that period he was a novelty on the scene and had a history of rapid and radical evolutionary changes.

MAN ALSO IS a novelty on the scene with a history of evolutionary change behind him. It may well be that like the opossum, he is entering a phase of evolutionary stability due to the special relationship he has established with his civilized environment.

So if I were forced to answer the question 'Has man's evolution stopped?' I might say, "Possibly it has."



## CLOUD OF COMETS SURROUNDS

THE SUN is surrounded by a large cloud of comets most of them at such vast distances they are invisible from the earth.

These comets may have been formed at the same time as other members of the sun's system from the original gaseous cloud and with further growth might have become asteroids or even planets.

Comets have very low temperatures. They are believed to be composed of icy mixtures of frozen matter. Even when comets approach relatively close

to the sun they remain... Their temperatures then reach about 190 degrees below zero heat due to the cooling effect of comet's volatile gases are released by solar heating. Dr. Bertram Dober, Wayne State University, Detroit calculated...

Because comets are so cold throughout their lifetimes they probably not undergone any extensive changes since their formation from original solar nebula.

## AL ELEMETS COMEIN EINSTEIN'S PRINCIPLE



EINSTEIN'S PRINCIPLE of equivalence is true for electromagnetic waves such as radio and light, two physicists at Harvard University have found.

The equivalence principle is one of the basic assumptions of Einstein's general theory of relativity. It states that no detectable difference exists between the force of gravity and the force produced by acceleration outside a gravitational field.

Earlier experiments have proved the equivalence principle for material bodies, but only recently has the effect of gravity on light rays and gamma rays been detected in the laboratory. If gravity and acceleration are equivalent, Einstein concluded that a gravitational field should lower the frequency of light rays escaping from a

gravitational field.

This effect, called the gravitational red shift, had not been conclusively measured until recently. Now Robert V. Pound and Glen A. Jr. have measured the change in frequency of gamma rays as they moved up and down through a column. They found that gravity lowered the frequency of the falling gamma rays and lowered the frequency of the rising gamma rays.

Their measurements of the gravitational red shift averaged 105 percent, the value predicted by Einstein, with an experimental uncertainty of 1 percent.



# Harvey Cushing



## master brain surgeon

by Cedric A. Larson

Few NAMES in the history of American medicine outshine that of Harvey Cushing, pioneer brain surgeon, master and genius of brain surgery.

He was at once a famed master surgeon, the foremost neurologist of his time, the discoverer of many new neurological facts, critical investigator, a noted physician, capable hospital administrator, inspiring teacher, medical bibliophile and historical artist and man of letters. He performed hundreds of operations where a single error might have meant immediate death. His monumental two volume *Life of Sir William Osler* won the Pulitzer Prize in 1926. At the time of his death in 1939 he held 23 honorary degrees, memberships of various kinds and honors in most of the medical circles of the world. His career spanned four and a half decades of brilliant work in the medical laboratory, in the medical arena on the front line battlefields of World War I, in the consultation office, in the hospital wards and in the operating room.

Before Harvey Cushing brain surgery had been a more or less hit or miss affair. He made it into a well defined science and created a new technique of brain surgery. He took many a hopeless case and through brilliant diagnosis and superb surgical skill restored the sufferer to a life of useful activity and health.

• • •

Harvey Cushing was born in Cleveland, Ohio, on April 8, 1869. He was a descendant of Puritan settlers who had come to New England in 1638. His great grandfather, grandfather and father were all doctors.

From school in Cleveland, Harvey went to Yale University. He received his A.B. degree in 1891 and then entered the Harvard Medical School. He was awarded an M.D. cum laude in 1895. After graduation he went to Johns Hopkins Hospital to work under the noted surgeon William S. Halsted (1852-1922). Dr. Halsted proved to be one of the chief influences of Cushing's subsequent career.

The Johns Hopkins proved famous for the discovery

blocking or regional anesthesia and the development of an operating technique, which consisted of thorough cleanliness, deliberate action at each step, careful handling of the tissues, and complete control of hemorrhage. Halsted also introduced the use of rubber gloves by surgeons and their assistants.

Halsted was in fact one of the 'Big Four' who so capably developed Johns Hopkins Hospital and Johns Hopkins University, the other three being Sir William Osler, William H. Welch and Howard A. Kelly. It is most significant that young Cushing studied for years under two of these—Halsted and Osler. And it is doubtful if either Halsted or Osler had any other pupil who mastered so thoroughly and completely the art of surgery.

### Skilled as Medical Artist

His training as a general surgeon completed, Dr. Cushing went abroad (1900-1901). Several months in Berne, Switzerland, in Hugo Kronecker's laboratory, making experimental investigations of the effects of increased intracranial tension on arterial blood pressure, were followed

by a period of study with Chr. Sherrington in Liverpool on brains of anthropoid apes. Skilled as an artist, Cushing made beautiful executed drawings of the topography of the cerebral surface, a practice which was to pursue in all his later records.

On a visit to Pavia, Italy, Cushing picked up a clinical model of S. Riva Rocci's new blood pressure apparatus with inflatable arm, which he adapted for use in all subsequent surgical work.

After his return from Europe, Cushing was made the neurosurgeon of the Johns Hopkins Hospital. Soon he had established a laboratory for animal experimentation connected with the Department of Surgery and named after the meeting English surgeon John Hunter. The Hunterian Laboratory. Here Cushing trained young men, graduates in comparative surgery, and in cooperation with his students he worked at experimental research programs.

For many years Cushing and his associates investigated the pituitary body. The most important of endocrine glands associated directly with physical development is the pituitary, a small structure attached to the underside of the brain, located right in the center of the head. It performs the double function of controlling growth and stimulating other endocrine glands through its "middleman" hormone.

Particularly vital to normal body development during childhood is the pituitary growth hormone.

CECILE A. LARSON teaches in the Department of Psychology, University College, Rutgers—the State University, Newark, N. J.

the growth of the skeleton and various internal organs proper functioning of the pituitary gland in producing this hormone may result in such abnormal conditions as dwarfism, gigantism or acromegaly (overgrowth of certain parts of the skeleton such as arms and jawbone). Dr. Cushing's book *The Pituitary Body and Its Disorders*, a work of 341 pages published by Lippincott, appeared in 1912.

During the period 1901-05 Cushing became great friends with the distinguished Dr. William Osler. Osler, a medical graduate of McGill University (1872), had served as professor of clinical medicine at the University

of Oslo, Norway. Here Osler carried out original and valuable researches on the diseases of the spleen and blood, and made eminent contributions to the study of the heart condition angina pectoris, and many other maladies. Cushing lived next door to Osler, and the two men were inseparable companions. In Osler's home he met the eminent medical men from all over the world. In 1905 Osler was

separated from the two their friendship was lifelong and a lively correspondence was maintained which was terminated only by Osler's death. Prior to Cushing's time it had been customary for brain operations

to be handled rather crudely. A neurologist would study patients with cerebral symptoms, recommend an operation, and direct the hands of the operator. This method was regarded by Cushing as anomalous and even dangerous for the mortal. It was high. To correct the situation he became an accomplished neurologist.

### Technique for Brain Operations

He insisted that the neurological surgeon should be personally able independently to make a meticulous examination of the nervous system, diagnose and localize a disorder, and be responsible for each phase of the operation.

Cushing's technique for brain operations was based on meticulous care in the handling of tissues, the use of layers of fine silk in closing the wound, the employment of small



cotton compresses to reduce bleeding, and the avoidance of shock to the patient. He kept a running record of blood pressure, closely observing it for any changes.

Fatilities were greatly reduced, and Cushing's methods became standard procedure in American hospitals.

Cushing was among the first physicians to call attention (1897) to the importance of X-rays for obtaining exact knowledge of the interior of the body.

On June 10th 1907 Cushing married Katherine Stone.

Cleveland They subsequently had five children

In 1910, Cushing was simultaneously appointed professor of surgery at Harvard Medical School and surgeon in chief at the new Peter Bent Brigham Hospital

His work at the hospital and the peak of his development in neurosurgery, went on until the outbreak of World War I At first he kept his interest in the general surgical clinic but his prominence in neurosurgery was so exceptional that gradually this field absorbed all his time and energy His specialty was brain surgery One operation a day was normal for him in peacetime but during the war a few years later he performed as many as eight

• As a physician in the Brigham Hospital, he was a quick and penetrating observer also noted for the warmth and cordiality of his bedside manner He would visit scores of patients take a genuine interest in their health and comfort and give them words of encouragement and cheer He insisted upon complete case records for each patient

• As a professor who taught surgery, Cushing liked what he called the apprentice or 'Hippocratic' system of teaching students at the bedside In his wholehearted support of this method of teaching he went so far as to advocate that instead of requiring courses in the medical sciences as preliminary to clinical experience the wards should be thrown open to students from the onset of the medical curriculum  
The onset of World War I opened

a new and exciting chapter in the life of Harvey Cushing Never a moment on the sidelines he saw the action on the Western Front at close quarters His first duty was in the spring of 1915, some nine months after the outbreak of that conflict when he served with a Harvard unit in the American Ambulance Neuilly, France At that time he became familiar with the French service de Sante On a tour of France he saw first hand the work of the Royal Army Medical Corps

He returned to America as part of the preparedness campaign and as a reserve medical officer tackled the task of organizing the Base Hospital Units were recruited from the professional staff of a number of university medical schools As head of one of the units known as Base Hospital No. 2—the second military organization of any kind officially sent overseas—he sailed for France in May

### On the Western Front

Throughout 1917 he served as operating surgeon with the 1st Central Postal Directory unit for special duty during the battles for the Messines and Passchendaele ridges In June 1918 he was transferred to the Medical Department staff of the American Expeditionary Forces as senior consultant in neurosurgery and participated in three major engagements: Chateau Thierry, St. Mihiel and the Argonne He operated on critical cases for periods as long as 16 hours at a stretch



## 1869-Harvey Cushing-1939

Throughout the war Cushing kept a journal of his experiences in the field. The best portions of this journal were taken from this record and published in a 534-page book in 1936, which bore the title *A Surgeon's Journal*.

In 1918 at Chateau Thierry he worked so hard he came down with trench fever, temporarily lost the use of his fingers and could not work easily again. He regained the use of his hands and returned to the field, however, as a result of the strain of wartime strains he was a sufferer from arterial disease for the remainder of his life.

Through this period of physical exertions his public reputation continued. His contributions to the care of intracranial war wounds set the proper methods in the field. For his great contribution he was honored by the United States with the award of a Distin-

guished Service Medal, by Great Britain with the Order of the Companion of the Bath and by France with the Officer of the Legion of Honor. He attained the rank of colonel in the U.S. Army.

During the war there were several trips to England and each time he managed to visit his old friend Osler. He was greatly moved with sympathy by the tragic death of Osler's son Revere, who was killed in the war. Osler had received many honors in England and had been knighted.

### Won Pulitzer Prize

After the war he returned to Boston and resumed his labors in neurosurgery. He soon found himself as busy as ever and surrounded by a staff of capable assistants in the midst of all this Sir Osler died, and at the request of Lady Osler he undertook



of a biography. It was a labor of love, but it consumed almost five years of his spare time—evenings, week-ends and summers

Eventually the great two-volume biography appeared with the imprint of the Oxford University Press in 1925. Volume I totaled 685 pages, and Volume II, 728 pages, and both contained many photographs. The monumental biography was written with great felicity of expression, charm and style and was awarded the Pulitzer Prize in biography for 1926.



might be regarded in the primary source materials mine, particularly as they to the nervous system during this golden period of activity. Besides these books he published some 150 papers and during this period

Cushing was the first to use high frequency currents in logical surgery. He consulted Dr W. T. Bowie a physicist who had developed two separate frequencies, one for cutting cancerous growths, one to cut tissue without bleeding, other to coagulate a vein if it be severed or a vessel artery and bleeding.

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basophilism were hailed in  
ircles as a great discovery  
was subsequently named  
s disease in his honor He  
only discovered an entirely  
se but had thoroughly de  
an l hed its course  
pment

He gave up surgery but remained  
at the hospital for another year,  
doing research work on the brain

### Professor at Yale

The following year Cushing went  
to Yale as the Sterling Professor of  
Neurology (1933-1937) This was  
an active post and not simply an  
honorary sinecure He took with  
him his collection of brain tumor  
specimens and photostatic copies of  
patients records and continued the  
study of this great mass of material  
the source of many articles and  
some books

Though the Yale professorship  
terminated in 1937 Cushing's work  
continued unabated In 1937 he  
became professor emeritus and re  
ceived the title of Director of Studies  
in the History of Medicine at Yale  
He published his great volume on  
the meningiomas (tumors of the  
brain and nervous system) in 1938



On the occasion of his 70th birth  
day Cushing's publications were  
listed in book form and published  
for a birthday celebration on April  
8 1939 by the Harvey Cushing  
Society a group of young  
gists who had studied under  
ing Honors had come  
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is 1938 he had  
to receive the de  
ence honors

Cushing was stricken with a coronary condition in early October 1939. He was admitted to the hospital, and died early on the morning of October 7th. The world had lost perhaps the foremost physician and surgeon produced by America.

• • •

Cushing once wrote "Rarely is it safe to prophesy any durability of recognition, whatsoever the accomplishment. Fame that is contemporary, fame that for a time endures,

and fame that actually accumulates differ in quality as differ the flares of a meteor, the glow of a comet, the permanence of a fixed star when the contemplation of both man and his achievement truly spires and ennobles us will they remain indivisible to be praised by people for time everlasting."

Today, 21 years after the passing of Harvey Cushing, his career work seems destined to fit into the last named category.



## Children Hardest Hit by Fallout

CHILDREN NOW FIVE and six years old will get the greatest doses of radioactive strontium 90 and cesium 137 already in the air from nuclear weapons tests. Dr. Wright H. Langham of the Los Alamos Scientific Laboratory has reported.

This is because they will be in their period of greatest growth—and consequently uptake of bone and muscle building materials—during the time of greatest fallout, he explained.

The biochemist calculated that the world average strontium 90 bone and bone marrow doses for today's children as a result of bomb tests to date would be 10 percent as high as those received from natural background radiation. The cesium 137 bone and bone marrow doses he added would be 5 percent of natural background. Strontium 90 can cause leukemia, so-called cancer of the blood.

Doctor Langham said he was not assessing the potential hazards to the population if any of the errors

as far as genetic changes are con-

cerned. Dr. Langham said that children before they reach 30, most people are through having. Children would receive doses of cesium in their germ plasma of between 1 to 2 percent of the dose from the background.

Nuclear weapons tests not counting the recent French explosions have produced between nine and ten curies (a measure of radiation) of strontium 90 and between 11 and 12 million curies of cesium 137. Dr. Langham estimated.

Of these amounts about 1/3 of the earth close to the test sites and 1/3 has already fallen to earth all over the world and the other 1/3 is in a stratospheric reservoir which is leaking down on us all the time.

Doctor Langham said the United States and the Soviet Union could have planned the location of their test sites any better if what they were to hit the greatest population concentrations of the earth with the long range fallout.

Ten or more major earthquakes occur annually

# When The Earth Shakes

by William L. Laurence

Condensed from *New York Times*

TEN OR MORE major earthquakes shake the earth every year. The best of them releases about a hundred times more energy than an atomic bomb of the type that destroyed Hiroshima and Nagasaki. The earthquake in Assam, India, in August 15, 1950, the second largest earthquake on record.

Though destructive earthquakes are relatively few in number, small ones are common.

The crust of the earth is constantly being remolded as the result of tectonic forces everlastingly at work shaping the rocks of which the earth consists.

Dr. Arthur Beiser of New York University states in his recent book, *The Earth*, "most evidence points to sudden movements of solid rock along faults in the earth's crust as the cause of earthquakes." "The cause of earthquakes is the sudden movement of faults," Dr. Beiser states, "the scars of earlier fractures in the crust."

the crust which occurred when the stresses within the earth become too great for the rock to support.

An additional stress, if large enough, may cause a further slippage and this slippage in turn sends out shock waves which may be felt over thousands of square miles in the case of a major earthquake.

As far as the earth's interior is concerned, an earthquake is like a vast explosion which sends out vibrations everywhere.

These vibrations are transmitted through the earth as a series of tremors or waves which are recorded on distant seismographs.

The duration of a shock at the focus or site or the disturbance as well as directly above the focus, at what is known as the epicenter, may occupy only a few seconds or minutes but the transmission of the waves may take many hours.

Maps showing the location of epicenters indicate that most earthquakes occur at sea. There are two prominent earthquake belts, one around the shores of the Pacific Ocean, the other running about the earth through the mid-oceanic region.

## NEXT MONTH IN SCIENCE DIGEST



### ODORS AND YOUR EMOTIONS

*Odors play a dominant part in the lives of animals and an important part in the lives of men. Anticipating odoriferous movies by 2000 years. Here used a system of silver pipes to waft perfumes over dinner guests. Historic delights on odors emotions.*



### ELECTRONICS WITHOUT ELECTRICITY

*A block of metal or plastic with holes in it is making complex and sensitive devices simpler, cheaper and more reliable. This is EFA—pure fluid amplifier—which involves no moving parts.*



### 6 REASONS WHY MEN STEAL

*Stealing is an ugly word, says the writer who is head of the department of psychology of a leading university, but it appears to be an undeniable fact that stealing is a deeply ingrained propensity in human nature. This article tells you why.*



*and many other provocative informative articles about what this changing world means to you*

They coincide in a general way with the two volcanic zones, but they are not regarded as necessarily connected except that both the volcanic and earthquake belts follow closely young mountain systems on land and the depressed troughs at sea. Both are thus connected with comparatively recent geologic disturbances in the earth's crust.

The earthquake and tidal wave that crushed Agadir, Morocco, last

March, taking a toll of thousands lives, registered as just an ordinary quake on the seismographs of Lamont Geological Observatory, Columbia University.

THESE INSTRUMENTS rooted the rocks of the Palisades cord 200 like it every year quake however, was remarkable that it occurred in a region in which heavy earthquakes are virtually known.

However on September 9, 1934 there was a severe quake at Orville in northern Algeria, at the opposite end of the Atlas Mountain from Agadir. It killed 1400. The Moroccan tremors were attributed to faulting or fracturing in the Atlas range.

Maurice Ewing, director of Lamont Observatory, pointed that the tidal wave which was reported to have swept 300 yards from Agadir did not necessarily point to a submarine origin for the quakes. The tremors could have produced an immense undersea landslide or "slabidity current" which could turn have created the tidal wave.

Doctor Ewing further pointed that the severity of tremors recorded around the world is not necessarily a mark of their destructiveness. Much depends on factors as the nearness of cities, elasticity of the terrain beneath, and the presence or absence of tidal waves.

Jack Oliver, a seismologist at Lamont said that in this case the centers of the quakes (there

hem) must have been right  
city

Dr Keith Edward Bullen of  
University of Sydney, Australia,  
the world's leading theorist  
the structure of the earth's  
has pointed out that the  
earthquakes has given sci-  
the most valuable tool with  
to probe the interior of the

There are two types of waves  
travel from an earthquake  
downward into the earth.  
The primary or P waves  
have the particles of the earth  
moving longitudinally as the waves  
travel and the S or secondary  
waves in which the particles move  
transversely. In solids the P waves travel  
faster than S waves.

P waves which go right  
through the earth to the other side  
in 8 minutes and 12 seconds to

Earthquakes do not transmit S waves  
through the core. It follows that those  
parts of the earth found to transmit

both S as well as P waves are solid.  
Failure to detect S waves is evi-  
dence that the part of the earth con-  
cerned is in a fluid state.

One of the early triumphs of seis-  
mology was the discovery and pre-  
cise location of a central core of the  
earth at a depth of 1 800 miles be-  
low the surface. As the radius of the  
earth is nearly 4 000 miles the ra-  
dius of the central core is thus 2 200  
miles. The region above the central  
core is called the mantle of the earth.

UNTIL 1936 it was believed that  
the central core was of uniform  
composition. Then a Danish woman  
seismologist Miss I Lehmann pro-  
duced evidence of the existence of  
an inner core of an 800 mile radius.  
Further work in the United States  
and in England lent strong support  
to Miss Lehmann's conclusions. The  
latest evidence was provided by seis-  
mic waves produced by the explo-  
sion of four megaton size hydrogen  
bombs by the United States at Eni-  
wetok in the Pacific in spring 1954.

## Say Life Could Exist on Venus

WATER vapor in the atmosphere of  
below the cloud level is more  
abundant than has been thought. A  
Hopkins University scientist has  
said.

• • •

Dr John Strong said that water  
in the atmosphere of Venus was  
measured by scientists studying rec-  
ords of the planet made from a manned  
balloon flying some 15 miles above the  
surface in November 1959.  
The scientists have suggested this

finding raises the possibility that some  
sort of life could exist on Venus.

Finding water vapor in the atmos-  
phere of Venus is the first indication  
of water on the planet which is known  
to have a great deal of carbon dioxide  
in its atmosphere.

The amount of water measured in  
the Venus atmosphere is about 10  
times more than found in the  
stratosphere and is about 100  
times above high level clouds.  
Strong reported.

Drugs, surgical techniques, tiny hearing aids are some of the

## New Tools To Defeat Deafness

by Elizabeth Honor

*Condensed from Cosmopolitan*



**I**N 1954 a Detroit automotive executive's business tensions were becoming intolerable as it became increasingly difficult for him to hear. Two years later, he was again relaxed and conducting his business with ease. He had regained 90 per cent hearing.

No miracle, but a dramatic operation—the hour long fenestration operation that makes a tiny “window” between the middle and inner ear where bone growth has blocked out sound—has saved him from the terrifying isolation of deafness. On the operating table, he had heard the doctor's voice clearly. Ten days later packing removed from his ear, he had left the hospital. And “I waited eight years!” was his unabridged reaction.

In 1956 in California a hard of hearing housewife burst into tears when her husband arrived home from the office and shouted at her. “What have you been doing today?” Asked in a normal tone the question would have seemed like friendly

curiosity. Shouted, it became wife an accusation that she had done nothing all day.

But in August 1957, one day after undergoing the new the three stripes mobilization (this one only two years) she walked out of the hospital for the first time in six years—her husband's normal—and accusatory—voice.

The operation had replaced defective key bones in her ear with a plastic tube. The eardrum to her reaction “I even turned on the kitchen faucet—I could hear it!”

In 1959

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tion Brother!

17 million people who have  
ss—about one in every ten  
the United States—such  
defeating poor hearing are  
On the list of advances are  
that are ushering out such  
meningitis infected si  
nd adenoids all common  
deafness

struments uncannily meas  
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s the GSR—galvanic skin  
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ch a child hears by the  
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Clues to the terrors of living in  
this cottony world come from the  
deafened themselves 'The tender,  
the intimate the loving things are  
gone' 'If my child is sick I  
can't even telephone a doctor

Says one Imagine yourself in a  
room with a locked door and people  
are talking to you from the outside  
You can hear the sound of voices—  
but you cannot understand what  
they are saying

Take the irritation and tension  
of this situation Multiply it 100  
times a day then by 365 This is  
the emotional load that people who  
are hard of hearing must carry

Among their fears permanent  
deafness irritating their employers  
and losing their jobs loneliness  
being misinformed because they  
dare not ask questions

What causes hearing loss? One  
man after attending a business con  
ference in which he realized he had  
missed most of the important points  
hurried to an ear specialist Exami  
nation revealed he had conductive  
deafness middle ear impairment  
which is the problem of 40 percent  
of the people who begin to miss  
what's being said He was one of  
the 20 percent whose conductive  
deafness is caused by ear infections  
or inflammation since childhood  
Drugs and treatment gave him close  
to normal hearing

#### Advances in Surgery

Had he been one of the 20 percent  
whose conductive deafness is due  
to oto-sclerosis—an accumulation of  
bone tissue in the middle ear which



Hugs, sign language, tiny  
hearing aids are some of the

# **New Tools To Defeat Deafness**

*by Elizabeth Honor*

*Condensed from Cosmopolitan*

t down from above and fashion into a serviceable new drum.

tion "Brother!"

the 17 million people who have loss—about one in every ten in the United States—such in defeating poor hearing are On the list of advances are gs that are ushering out such as meningitis, infected sinuses and adenoids, all common of deafness.

Instruments uncannily measuring even in infants' newest is the GSR—'galvanic skin response'—test which measures such a child hears by the t he perspires as he awaits electric shocks.

#### Acoustic Aids

Electronic advances are creating ; more successful hearing ; currently in the works is a mechanism that is a sound "It spaces out rapid conversation." It spaces out rapid conversation. A Linotype spaces words in if type. Newly designed surgical instruments make such operation fenestration and stapes mobilization possible. Of great help to deaf are glasses that magnify eardrum ear bones to 40 times normal size.

It is it like to be deaf? What is to the personality of someone losing his hearing? In December 19 at the Chicago meeting of the American Association for the Advancement of Science, impaired hearing was revealed to have a very direct effect on an individual's personality.

Clues to the terrors of living in this cottony world come from the deafened themselves. "The tender, the intimate, the loving things are gone." "If my child is sick I can't even telephone a doctor."

Says one: "Imagine yourself in a room with a locked door and people are talking to you from the outside. You can hear the sound of voices—but you cannot understand what they are saying."

'Take the irritation and tension of this situation. Multiply it 100 times a day then by 365. This is the emotional load that people who are hard of hearing must carry.'

Among their fears, permanent deafness, irritating their employers and losing their jobs, loneliness, being misinformed because they dare not ask questions.

What causes hearing loss? One man after attending a business conference in which he realized he had missed most of the important points, hurried to an ear specialist. Examination revealed he had conductive deafness, "middle ear" impairment which is the problem of 40 percent of the people who begin to miss what's being said. He was one of the 20 percent whose conductive deafness is caused by ear infections or inflammation since childhood. Drugs and treatment gave him close to normal hearing.

#### Advances in Surgery

Had he been one of the whose conductive deafness is caused by otosclerosis—a hardening of the bone tissue in

causes the footplate of a small bone that looks like a stirrup to become rigid and fixed, so that sound fails to reach the inner ear—a stapes mobilization or a fenestration operation would have been the solution.

In ideal cases, 80 percent of patients may gain close to normal hearing after fenestration. Ideal subjects for stapes operations have about a 30 to 70 percent chance for successful results. Only since 1939 has fenestration opened doors to sound. Only since 1952 have startled stapes patients while on the operating table heard the tiny click that signals their new hearing. For pregnant women and young people in their 20s or 30s who are particularly susceptible to otosclerosis, one of these operations can mean a world regained.

Nerve deafness which affects the other 60 percent of deafened people of all ages has a variety of causes—and there is help for all of them. Causes of nerve deafness range from underwater swimming to neglect of abscessed teeth. Among those hardest hit are children.

"Why is my child deaf?" is the heartbroken wail of millions of mothers. In the United States 3 million school children and an *uncounted* number of pre-school children are known to have hearing loss.

Otologists believe that early detection and treatment may prevent at least half of deafness. "About 80 percent of early deafness occurs before a child is five years old," reports the U. S. Department of Education, and Welfare.

About 15 percent of mothers have German measles or other viral infections in early pregnancy. In nerve deaf children. Parents with Rh blood problem can save their child from nerve deafness through transfusion. The common cold stands revealed as another major cause of hearing loss. So do mumps and scarlet fever. After colds and similar illnesses, children should have hearing tests.

### Child Can't "Grow Out of It"

"My child will grow out of it" is a comforting thought but a fallacy. No child "grows out of" deafness. "The pathetic thing," says one otologist, "is that often we find a child for the first time at the age of three or four. This is tragic. Valuable years of medical and educational help have been lost."

Between the ages of two and three a child's speech develops. For this reason hard of hearing toddlers wear hearing aids. Even babies with extreme nerve deafness can learn to chatter with other children and adults. A new program began in 1956 at the Hearing and Speech Center of Bellevue Hospital in New York has proved that very young children who are markedly deaf can learn to talk more normally and naturally.

This is not the arduous old method of specialized training in reading, feeling of a teacher's throat for vibrations—from which a child learns a "mechanical" speech. An infant today can be fitted with one of the advanced hearing aids.

onics research during World I made possible. He is trained normal play. Result: children hearing impairments are now at public schools in increasing numbers and often they top their mates scholastically.

"I'm not deaf!" is the often angry, defended answer to the some exasperated question, "Why don't you get a hearing aid?" To put ting help is dangerous. Neglect of conductive deafness becomes permanent. Yet, teenagers still wait an average of seven years before seeking help and adults wait an average of 10 years.

Children are happy with hearing aids. Self-conscious parents do not like the feeling that there is something "wrong" or embarrassing about it. Explains one psychologist, "Hearing aids are an extension of a person's ego. A parent sometimes feels that if he lets his child wear a hearing aid, he will be admitting weakness."

For a small child who has never known the wonder of sound is some almost inexpressible. One four-year-old girl with nerve deafness was found for the first time when a psychologist at the New York League for the Hard of Hearing tested earphones over the child's ears and tuned up the volume above normal. The little girl then ran to her father, emptied his pockets of everything that looked like money, poured it into the audiologist's hands and ran toward the door, protectively holding the earphones.

Yet, "A hearing aid will make my child 'different' " is a familiar complaint. But "not as different as he is without the aid " say researchers at Columbia University. Investigation shows that children wearing hearing aids have better health and fewer personality problems than those children who need aids and do not wear them.

Easy prey for quacks are the hopeful hard of hearing people who are out for a miracle 'cure'. Quacks claim they can cure deafness by massage, injections, drugs. Millions of dollars are wasted on charlatans who do nothing but harm.

### Variety of Help

It is easy for a person with a hearing loss to find out exactly what is wrong—and what can be done about it. He can write to his County Medical Association for a list of accredited otologists. He can write to The American Hearing Society, 1800 H Street N.W., Washington, D.C. for the name and address of the branch nearest his town or city.

Some people, unaware of what's available, are saved by sheer luck. One father of a deaf child spotted a nine-year-old boy on the street. The youngster, wearing a hearing aid, was chatting with a friend. The father followed the boy to the New York League for the Hard of Hearing office and explained, "I want my son to be like this boy."

The league, out of which grew the American Hearing Society, offers a staggering variety of help.

In one of the rooms,

marine seaman with a conductive hearing loss who has boosted his hearing 40 percent with a hearing aid. Speech classes have remodulated his voice which during his six months of deafness took on the flat deaf quality.

Down the hall a 41 year old salesman grapples with the problem of sudden deafness. A year ago he had an income of \$50,000. But three months ago after leaving a theater with his wife and another couple he was mugged in the parking lot where he had gone to get his car. His temporal bone was crushed the nerve killed. A gregarious personality he is still being helped to overcome the emotional shock of deafness. He is now one of the 2 percent who hear nothing but he will get help from a hearing aid that conveys vibrations.

His wife has cooperated with a teacher to help him learn to lip read. His sense of balance damaged he has learned to line up a picture on the wall to make sure he is standing straight. He is getting over his bitter depression. He has become an insurance actuary.

### Speech Classes

Into the reception room comes a pony tailed 11 year-old girl. The small barrette that holds up her pony tail is one of the new tiny transistor hearing aids. A clear plastic tube goes into her ear. Since the age of two she has worn a hearing aid for congenital nerve deafness. She has arrived today to make sure her pronunciation isn't slipping.

ping she will attend a speech hearing class.

In another room a schoolboy wants the help of a hearing aid. He specifies eyeglass aids—I'll wear plain glass in them. He is given an audiometer test he tries on makes and models of aids to find out which is most comfortable. It gives him best far and near which the most natural tone then referred to the company. He has the model and style best for him. If he can afford it the boy pays for it himself.

Doors to careers to the entertainment of movies TV theater arts are opening to the hard of hearing. Humor and trivia which have been called the conversation of the deaf are becoming more important. Yet in 1938 a word like "gobbledygook" would have sounded strange.

In 1947 no one would have believed that by 1960 hundreds of thousands of people would be in touch through tiny transistors.

In 1950 no one would have believed that a hard of hearing person could learn normal or close to normal speech.

In 1951 no one would have expected that by 1960 there would be the delicious feeling of being warned after an earthquake like states mobilization that were simply not to shampoo hair for four weeks or swim for months.

The real miracle is that such patients can hear clearly, a word the surgeon says.



ings which are Caesar's ."

hand this note to your "wise  
d ask him to identify for me  
on the front cover (April  
the left of Gandhi. My circle  
know. Some said it was  
to me, that is nothing doing  
JOHN C WINEMILLER  
WESTERVILLE, OHIO  
esar —EDITOR

ous"

e DIGEST is a marvelous mag-  
onder if it is as well known  
t to be, it could do much to  
ate young America in science  
ng much to be desired in to  
ld

(MRS) ELIZABETH TERRY  
ADRIAN MISSOURI

### Restless Tides

ing the article 'Secrets of the  
ides' (April '60) I was sur-  
see the following 'Spring  
ill moon, when the moon and  
re both on the same side of  
are larger than the 'spring  
uced at the new moon when  
and 'sun are lined up but on  
ides of our globe'  
it be possible that the moon  
ared at all the

ing and decided to change the positions  
of new and full which have been the  
standard for millions of years?

BETSY EHREBAR

GREAT NECK, NEW YORK

To Miss Ehrbar, and the other "sur-  
prised" readers who wrote, we acknowl-  
edge printing the error about the rela-  
tive positions of the earth, moon and  
sun in respect to the time of the full  
moon —EDITOR

### Diet Article Most Helpful

Sirs

Your article "How To Lose Weight  
Wisely" (May '60) is the most helpful  
article I have ever read, and it has  
been placed in my files for re-reading  
weekly! I am a longtime subscriber to  
SCIENCE DIGEST

(MRS) GLENN MAREK  
WAUKESHA WISCONSIN

### Centipede Cerebrations

Sirs

In a recent issue of your magazine I  
read an item about a centipede who,  
wrestling for an answer to a disarm-  
ingly simple question about his loco-  
motion, lost his sleep and his locomo-  
tion to boot. Perhaps you have run  
across the little verse which states the  
centipede's difficulty

A centipede was happy quite

Until a frog in fun

Said 'Pray, which foot comes after  
which?'

This put his mind in such a patch

He lay distracted in a ditch—

Forgetting how to run

A J HAMILTON

KINGSTON (ONT) CANADA

### Use of Ether

Sirs

The writer of "Those Amazing  
ethetics," apparently overlooked  
Crawford W Long who reputed  
the first to use ether as an

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CITY ISLAND, N.Y.

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# Twenty Years Ago In Science Digest

## 1940

**Medicine**—Conquest of the entire world of disease-producing germs seems possible as a result of the discovery of germs in garden and field oil which destroy the germs of the gram-negative group. The discovery was made by Drs. Selman A. Waksman and H. Boyd Woodruff of the New Jersey Agricultural Experiment Station.

## 1940

**Atomic Science**—A chunk of five to ten pounds of a natural substance—U-235—would drive an ocean liner or an ocean going submarine for an indefinite period around the oceans of the world without refueling. One pound of U-235, the substance recently isolated in pure form by Columbia University scientists, is equal in power output to 5 million pounds of coal.

## 1940

**Radio**—With frequency modulation radio, known as FM, given the green light by the Federal Communications Commission, the stage is set for rapid changes in radio—provided war does not freeze the present art and development. Within a few months or a year all the larger radio sets will be built to receive both the more ordinary amplitude modulation signals and FM.

## 1940

**Biology**—Studies on 65 000 college freshmen in North Carolina, Kansas, Kentucky and Wisconsin during the past 11 years show a tendency toward a decrease in stature. This reverses the tendency of former generations to grow taller and mature at an earlier age.

## 1940

Continued on page 132



# Shark Survey

A census of attacks by sharks on human beings all over the world is being carried out through the Smithsonian Institution.

There is no question of the seriousness of the situation. The ultimate aim of the study is "to do something about it," according to Dr. Leonard B. Scott, Smithsonian curator of fishes.

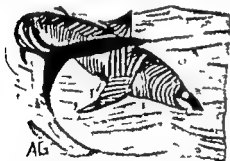
A large documented file of shark incidents throughout the world is being maintained. When an attack occurs anywhere, an attempt is made at once to establish contact with a physician or scientist in the area, and his assistance is solicited in obtaining complete documentation of the attack.

In January of each year a list will be prepared of all shark attacks all over the world during the previous year.

A research panel is appraising the effectiveness of various antishark measures, such as use of meshes around bathing beaches and employment of various physical and chemical repellents. Rigorous methods have been developed for testing the repellents, especially in Caribbean and Pacific waters. Photographs of shark attacks are being obtained.

There can be no question, says Dr. Schultz, that sharks are terribly dangerous in most warm and temperate ocean waters. There are about 25 species of these ferocious fishes. Most dangerous regions of the world are along the southeast coast of Africa, the tropical Atlantic, the Pacific coast of America, and Hawaii.

The creatures are almost ubiquitous. Some of the most dangerous, for example, have ranges extending in summer from the Caribbean to the New England coast. They have been known to attack swimmers in as little as 10 feet of water.



Probably the most dangerous is the great white shark, *Carcharodon carcharias*, which inhabits all tropical seas. Another is the tiger shark with its razor-sharp teeth, which can rip off a human leg.

Apparently, says Dr. Schultz, sharks have some mechanism by which they can detect slow motions in the water. A trace of blood in the water is also known to attract them. They will attack anything in the way of such as would be made by bathers. The creatures are uncontrollable. They will attack anything in the way known to attack boats.

At present, says Dr. Schultz, the best advice is never to enter shark-infested waters alone, but it is hoped that the present research will lead to something more practical as a safeguard against sharks.

# SCIENCE DIGEST

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## A Tooth for Every Job

There is no more apt description of a man devoid of dentition than "toothless as a bird." Of all the vertebrate animals, from fish to man, the birds are the only major group characterized by absence of teeth. There are creatures here and there without these useful tools, such as the turtles, but these are the exceptions to the rule.

Even the lowest forms of fishes, the lampreys which completely lack jaws, have toothlike structures with which they rasp away the flesh of their prey. Sharks and bony fishes in general have a mouthful of teeth variously shaped for biting, crushing and holding.

As a group the amphibians are fairly well toothed, including "teeth" on the roof of the mouth in many forms. These amphibian teeth are generally small, pointed and serve mainly in holding and forcing food into the throat.

The magnificent set of teeth of the crocodile is an excellent example of the good use this class of animals makes of its dentition. Reptilian teeth are typically pointed for holding of prey, and they lack roots.

Snake teeth are generally curved backward and may occur in several rows on the jaws as well as on the roof of the mouth. The snake's lower jaw can be unhinged in the middle. It feeds by alternately moving one half of the jaw, then the other, dragging the prey into its throat by the recurved teeth.

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have been lost in evolution, perhaps in part as a means of reducing the weight of the head region as an aid to flight.

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in mammals can often be determined on the basis of one or a few teeth.

The primitive number of teeth in the mammals is 44. Opossums have 50, but most show a reduction from the basic pattern. Man, for example, has 32 teeth, while the rodents may boast of only 16, though they can do a lot of gnawing with those few.

Mammalian teeth are generally specialized into four kinds: incisors in front for cutting, then canines for stabbing, finally premolars and then molars for grinding and shearing.

—Horace Loftin for Science Service



by Harry Schwalb

**Condensed from The Laboratory**

CONNECTICUT CLINICAL research  
ers on a project entitled Size  
Scientific Abbie watched him  
at work and discovered that  
portions of sugar foods satisfy  
le as much as non sugar snacks  
ning many more calories  
ish cotton chemists used sugar  
size textile finishing agents  
ke wrinkle proof collars for  
tionally conscious country

the Wolfe Agricultural Laboratory in Florida tomato plants treated with sugar solution and planted under adverse conditions survived all the shocks be-

Children's Village (Dobbs  
N. Y.), 102 boys chewed a  
laboratory (N. Y.) 25  
en life C company  
Penn 11 2124

6 inch section of sugarcane daily under lab supervision, a second group drank sugarcane juice a third got neither. In 18 months the hard chewers had developed greater tooth decay resistance than the other two groups.

• I dible detergents fast-drying house paint tough plywood adhesives faster growing baby pigs and chicks burn resistant tabletops — these are still other achievements of one of today's liveliest laboratories fields sugar research

That sugar is the subject of a multi nation multinational search program is only one of the oldest food processes.

Bread, cheese and  
which trail back to  
all depend on...

While the sugar industry may not have as long a recorded history as the others, it does have the distinction that its process is specifically aimed at the prevention of micro-biological action.

Mechanical crushing and grinding, clarification by chemical additives, heating and skimming, evaporation, crystallization, draining or separating the molasses, drying the final crystals—just how early these elaborate steps were incorporated into a continuous process is not known, but solid sugar was being transported in quantity in the first centuries of the Christian Era.

Even the sugarcane plant differs in a noteworthy way from other plants. No easy transporting of seeds in dry compact form for it—sugarcane can be transported only as plants or cuttings followed by weeding and care. Man's prehistoric western dispersal of garden growth sugarcane from New Guinea—sugar's home—to Indonesia, the Philippines, Malaya, Indochina and the bay of Bengal area began 8,000 years ago, took some 3,000 years to complete.

Evaporation of cane juice to a solid state developed in India (note the use of the Sanskrit word *kanda* for solidified sugar, the basis of our word *candy*). Even though sugar in its solid form was looked upon as a luxury or an ingredient of medicines in these early days, it became a manufactured product in the modern sense and by the 10th century A.D. both Persians and Egyptians were refining it.

From the Mediterranean, sugar eventually took its place as one of the great foodstuffs in the 15th and 16th centuries. As great explorers transported it, by 1600, the production of raw sugar from cane grown in tropical Asia had become one of the world's greatest industries—and one reason why tea and coffee could become so popular beverages on the tables of Europe.

A major revolution in sugar came with the vacuum pan patented in 1846 by E. C. Howard and the perfection of every vacuum pan in the world today. It's still used wherever the industry requires the evaporation of sensitive materials.

In Howard's pan—a closed system—liquid sugar is boiled under partial vacuum in order to convert the liquid into steam vapor and remove it from the solid—the sugar dissolved in it. Because of the reduced pressure in the Howard system, liquid reaches a boiling point at a reduced temperature. Here, when liquid sugar was boiled in open kettles at atmospheric pressure, it caramelized rapidly with a dark discoloration and heavy loss of solids.

An outgrowth of Howard's system was the multiple vacuum evaporator devised by Norbert Rillieux of Louisiana. Rillieux perfected the vacuum pans in a series and maintained a higher vacuum in each succeeding pan.

Rillieux's invention is the core part of all multiple vacuum evaporators used in the sugar industry in many other processes where economy and the removal of a

of solvent are involved. The sugar chemist and chemical Charles A. Browne, once Rillieux's invention 'the suspended centrifugal' in 1852 was still another

Organized in 1943 the Foundation has supported some 170 projects in universities hospitals and commercial laboratories in the U S Canada England Scotland Cuba and the British West Indies

Research in nutrition forms an important part of the Foundation's program. Work here has ranged from a basic investigation of sugar in human metabolism to a study of

the possibility of coating teeth with water repellent substances to prevent decay.

One of the highlights was the development of methods for preparing sterile solutions of the special sugar required for intravenous feeding of hospital patients.

Today, a full two-thirds of all sugar used in the U S reaches the public in commercially prepared foods—baked goods (including pre-mixes), canned

**WEBSTER** defines sugar as a sweet crystallizable substance colorless or white when pure occurring in many plant juices and forming an important article of food. The chief sources of sugar are the sugarcane and the sugar beet the completely refined products of which are identical and form the granulated sugar loaf sugar etc of commerce.

The old fashioned conical loaves of sugar are still made in some parts of the world (Belgian refiners produce it for the Bedouins of North Africa who will buy nothing else) but the only modern loaf sugars in America are cubes and tablets.

Incidentally the refined granulated sugar of commerce is 99.91 percent pure thus ranks as the purest of all organic substances produced in such volume.

and frozen fruits, soft drinks confectionery, ice cream. This pattern of distribution is a complete reversal of pre World War II when prepared foods and had not achieved their

granulated sugar in 1891 major sparkplug behind our sugar activity is the Sugar Research Foundation located high in 11 Street building that looks like the chugging, turning New water is



One recent discovery consumers like some familiar foods—for example canned fruits and ice cream—considerably sweeter than had been supposed. Preferences were ascribed not to added sweetness but rather to improved flavor.

Reason sugar in addition to adding sweetness masks sourness, bitterness and saltiness—the other tastes perceived by the tongue—actually enhancing the aromas which are sensed by the nose. Aromas are more readily held in solution by water than by sugar solutions. When more sugar is present aromas are freed and reach the centers of smell in higher concentration.

These concepts have been applied successfully to the laboratory improvement of the flavor of canned peaches, pears, apricots, boysenberries, tomatoes, corn—also to wines.

### Poultry to Plastics

But it's in the non food uses of sugar from poultry rations to plastics that current researchers really shine. In fact the term *sucrochemistry* had to be coined for the study of sugar as a basis for chemical manufacture.

Of the industrial and household synthetic detergents in current use the majority show some sort of resistance to breakdown by bacteria in the course of sewage treatment. Thus detergents contribute to the sourness of streams and rivers interfering with the chemical purification of metropolitan water supplies.

So researchers concentrated on detergents that can be

decomposed biologically developing promising ones based on sucrose.

Because of their high palatability, digestibility and food value these *surfactants* may be employed widely in food products. emulsifying salad dressings are other food products that are not added to the diet of people who have difficulty in digesting fat. They aid the absorption of fat from the digestive tract.

Some sugar detergents can be formulated into bars for toilet or dry use into shampoos that sting Junior's eyes and into creams and cosmetics.

And since sewage disposal plants can use sugar compounds as their source of food energy, the detergents disappear from the fast.

Alkyls are resinous compounds that chemists form by reacting certain complex acids and glycerol that Mrs. Housewife knows as 'porcelain' finish on her refrigerator.

### Drying Oils for Paints

Laboratory attempts to introduce sugar into this reaction as a replacement of glycerin were not successful but the work did lead to fast drying oils for paints. These sugar-based drying oils form glossy, even films that adhere to metal firmly, wrinkle less on drying.

There's a new plastic from too, as yet unnamed that retards stretching under bending stress and impact equivalent to—or better



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decomposed biologically, developing promising ones based on sugar.

Because of their high stability, edibility, digestibility and for use, these *surfactants* may be employed widely in food products, emulsifying salad dressings and other food products that are not. Added to the diet of people who have difficulty in digesting, especially the very young—they expedite the absorption of fat from the digestive tract.

Some sugar detergents can be formulated into bars for toilet or dry use, into shampoos that sting Junior's eyes, and into creams and cosmetics.

And since sewage disposal plants can use sugar compounds as their source of food energy, the detergents disappear from the waste stream.

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There's a new plastic from sugar too, yet unnamed, that resists stretching under bending stress and impact equivalent to—or

that of standard filled phenolics

The new plastic is 40 percent lighter (plus phenol and hydrochloride) it is not affected by heat and it doesn't acquire a static electricity when rubbed whereas many plastic materials do.

Also, the new resin looks good and is concerned with paper and wood impregnation, plywood molding and foundry bonding. Valite Division of Sugars Inc. is producing sugar plastic in pilot plant tests.

There is SAIB (sucrose isobutyrate) developed by Chemical Products Inc. It has the pleasant ability of molding plastics easier to handle and manufacture promoting soft

Other major experiments with sugar, hydrogen and oxygen have given chemicals from which fibers and pharmaceuticals are produced. And dextran, a substance produced by the action of certain bacteria on sucrose

is used for impregnation—of all things—and well drilling mud.

### Paper from Sugarcane

Byproducts are still another interesting subject of sugar research. From bagasse, the fibrous portion of the cane stalk remaining after crushing, comes sulfural used in making rayon. For a while itself has been shown by University of Florida researchers to be useful as cattle feed when spiked with molasses. Paper in which bagasse is the only fiber is being produced widely.

Sugar beet pulp too has a new look. These slices of beets from which sugar has been extracted long used in feeding farm animals are now ammoniated. This forms compounds which are acted upon by bacteria present in the digestive tracts of cows and other ruminants to synthesize valuable protein.

Thus in 1960 even Florida beef cattle benefit from the sweet hand of research while alongside Florida hotel swimming pools sunbathers sip icy daiquiri cocktails that benefit in their own way from the magic white "sand" called sugar.



### Tranquilizers Make You Feel Worse

DISCOVERER of the tranquilizer Dr. Frank M. Berger, president of Wallace Laboratories, said that he is not looking for a cure for tranquilizers in spite

of the fact that patients feel much worse taking tranquilizers than before, Berger said. He added that tranquilizers are used in treating mental illness but are not

# WHY YOUR HOSPITAL BILLS GET BIGGER



by Donald C. Carner

**T**ODAY your hospital bill is twice as high as it was ten years ago but only half what it might be in 1970. Despite the fact that cost of care has skyrocketed, almost every other family had a patient in a hospital last year. Why have hospital costs soared?

- Inflation?
- Higher wages?
- More complex treatment?
- Better care?
- Expensive equipment?
- Over-innervation?
- Larger staffs?

Each of these factors has had a direct effect on the hospital bill paid by 23 million Americans during the last 12 months.

## Wages Take 70 Cents

Wages for hospital workers to

day take about 70 cents of dollar spent for hospital care. Number of hospital employees increased significantly since World War II, and wage rates have risen faster than ever before.

Until 1945, most hospital work was on a 44- or 48-hour week. Now, the work week has dropped to 40 hours, and the number of employees has increased to keep pace with the increasing complexity of care, spurred by fantastic developments in medical science, has moved upward at a rapid rate.

The average length of stay in a hospital has been halved. Amazing advancements in treatment have been undertaken, and dozens of new skills and trained work forces.

Heart surgery is becoming more place. When the heart is in use, 20 highly skilled people

used to perform surgery and the equipment. Yet the patient is often discharged in less time than would be required following a similar operation.

Years ago nurses earned \$1.00 a month. Today, at Seaside Memorial Hospital, Long Beach, the scale for general duty registered nurses is \$330 to \$390 a month.

### New Instruments

Modern laboratories and diagnostic departments in a modern hospital are your doctor's dependents for rapid accurate diagnosis and treatment. The simple stethoscope with thermometer, sphygmomanometer and blood pressure apparatus are supplemented with scientific instruments often involving extensive electronic measuring devices. For example, catheterization for examination built around a television-like electronic device costing \$10,000 to \$15,000. It requires skilled technicians for operation and maintenance plus a heart specialist for interpretation. Electroencephalography, the electronic measurement of brain waves, is basic to accurate diagnosis of many conditions. It is basically an electronic recording and amplifying system containing 69 radio and television tubes.

Image amplification calls for a TV screen to magnify the image picked up by X rays so the radiologist may more accurately pinpoint the patient's problem.

Physical and occupational therapists utilizing hydrotherapy, ultrasonics, infrared heat massage, exercise and other forms of treatment, have accomplished wonderful results in reducing pain and speeding more complete recovery from illness and injury. Well-trained physical and occupational therapists add measurably to hospital payrolls.

Just a few years ago not more than ten people were involved in X-ray, laboratory and therapy work at Seaside. Today there are five M.D. specialists devoting full time to these tasks and guiding the work of Memorial's 54 highly skilled technicians, clerks and aides.

Hospitals too have felt the full effects of inflation in terms of the cost of construction, food, pharmaceuticals, supplies, utilities, insurance and the balance of items that account for the 30 cents of each dollar expended for these goods and services.

### Donations Drying Up

Another important element in the cost of hospital care is the change in pattern of donations. Before taxes were as high as they are today, many hospitals running in the red, assured that generous donors would pick up the tab at the end of the year. This enabled hospitals to charge less than cost for services. Not only does this mean

Ed C. Carner is a contributor of articles to Memorial Hospital of Long Beach, California. A highly regarded writer in the field of medicine, Carner is presently working on his book, "The Hospital Bill."

but the "donation shoe" is on the other foot. Today local, regional and state governments frequently are required by law to provide care for indigent citizens. Seldom does government pay the full cost of care.

Failure of government to pay full cost for its patients forces other patients to pay more than cost. For years New York City hospitals have provided care for the city's medical indigent patients at far less than cost. Effective July 1, 1960, city officials raised the per diem rate paid hospitals from \$20 to \$24, while recognizing that the current daily hospital cost is \$29.

Voluntary hospitals in New York City lose more than \$8 million annually because the city government will not pay the full cost of care for hospitalized patients. This situation is repeated by city and county governments across the nation.

### \$30,000 Per Bed

Construction of hospital facilities has become very expensive—\$20,000 to \$30,000 per bed is the current range for new and remodeled hospitals. Years ago most construction capital was contributed; now many hospitals have to borrow money. Recently Minneapolis hospitals raised \$17 million in a two-year city-wide fund drive. They will borrow about \$13 million more to obtain the sum needed to keep pace with needs of the community.

As former ...

Nursing education fits this term. Today a hospital-operated school of nursing must meet educational standards. Not so ago student nurses learned partly by doing and in doing did a great deal of hospital work which they received no financial reward. The patient paid less because the student contributed her effort in exchange for an education.

What is the outlook?

Costs will continue to increase.



You'll agree I believe that if you are in the hospital and need a nurse—you want her *right now* as long as your situation demands. You want her to be a real *mercy*, competent, skillful and standing, tactful, interested in you and your problems. I think you agree too that the registered nurse at \$2 an hour in today's labor market for someone upon whom you depend is a relatively low rate.

If a patient is going to get quality of nursing he wants, an hour of need, hospitals and patients will have to pay at least as much as the R.N. industry does for its workers. Hospital pensions, insurance and other fringe benefits will undoubtedly follow the pattern of industry, raising costs still higher.

Continuing to drive costs up will be the benefits of medical research.

Is the price worth it?

More lives are saved. We are

Recovery from illness is more complete if possible to measure the productivity of the hundreds of thousands of people now who might be otherwise dead. Judgment of the American would be apparent as increased their use of hospitals the greater dollar cost. Their bears out the value with Americans regard each life dearly points up the all out made to safeguard the health of every citizen. Cures for cancer heart disease her major causes of death are ped—regardless of cost—they undoubtedly be made available through our hospitals. America would deny better and longer life because it more?

### Is Over?

There are many signs indicating the worst of the steep climb. Unit costs may lie behind us. Simple hospitals formerly produced essentially the same amount for each patient regardless of individual requirements. More can was necessary for some a not enough for others. This reflected in the cost of care. More hospitals are thinking of needs as being divided into three categories: maximum self help, new \$10,300,000 Seaside hospital provided intensive medical and surgical areas for patients the maximum care during the

critical phase of their illness. In these areas will be concentrated the maximum number of nurses so that every acutely ill patient will be under constant observation and continuous treatment. Here a far lower cost prevails rather than that which would arise were each patient to need round the clock special nurses at \$50 \$60 a day.

After the patient has progressed in his recovery, he will be moved to the normal medical or surgical nursing unit. Here he will again have as much care as he requires but not as many nurses will be needed—and the cost will be reduced.

Seaside hospital is planned so that should experimental "self help" care prove feasible a floor designed for this purpose may be added. Then patients well along in convalescence would have their meals in a dining room. They would take their own medicine, bathe themselves and in other ways participate in their own care. Fewer nurses would be required and again costs would be reduced.

Of greater importance—more lives would be saved, recovery speeded and patients would be highly pleased with hospital care.

Electrically adjusted bed, electronic intercommunication between patient and nurses, piped oxygen, pneumatic tube systems and closed circuit TV are now making a more pleasant while increasing effectiveness of nurses.

There is great saving in maintaining certain supporting departments not dealing directly





from political interference and proper operating safeguards—hospitals provided all of the benefit from the fund drive.

• Your state law encourages this type of local government nonprofit community hospital ventures designed to provide expansion without throwing the burden on the hard pressed tax

## You Can Help

The American Hospital Association has estimated that \$1 1/2 billion in funds are needed for remodeling of these facilities together with new construction. If you are concerned about hospital facilities and rising hospital costs here is how you can help.

• By becoming a volunteer you will help turn the tide of high hospital costs.

• Show interest in your hospital. Find out who you know on the Board of Directors or Medical Staff. Learn what steps your hospital is taking to hold costs in line.

• If expansion is needed help raise funds by working on the campaign or bond issue so patients won't have to pay the full cost of new buildings and equipment.

• Help your hospital school of nursing become financially self supporting so that students will get a good education but not at the expense of the patient.

• • •

• Insist on local government paying the full cost of care if purchased. Have this question on the program of your local organizations. Pass a resolution and send it to your government officials so that old people will not have to underwrite government expense.



## Lethal Protons Fill Solar System

rays stream which fill much of the solar system with lethal radiation have been observed some lasting as long as 14 days.

Aster Kinsey A. Anderson of the University of Iowa said the data on the storms was gathered in a series of high altitude balloon flights last summer.

Scientists are uncertain as to the origin of the storms and it is not clear

that many years will elapse before their timing, their paths and their extent can be predicted with any accuracy.

The storms do not threaten the immediate goal of the man in space. He can be protected by the shield of the magnetic field. But the discovery raised serious doubts as to whether it will be possible to send men beyond the earth's magnetosphere.

A French anthropologist studies the evidence supporting its existence

# Is There An Abominable Snowman

by Eugene Schreider

Associate Director, Laboratory of  
Physical Anthropology, Paris

Condensed from *Discovery*

**A**N IMPROBABLE OCCURRENCE gives rise to speculation before a serious attempt is made to verify it and the existence of the abominable snowman is no exception to this rule. It has provided the occasion for numerous articles but there has been very little real critical analysis.

Verification is difficult for two reasons. Firstly it requires expeditions to inaccessible parts of the world and secondly since this is rather a thankless task it will probably be left to those who are already convinced to take the initiative. Only the converted who believe that the snowman really exists would be prepared to face the hard hips and the dangers of such an expedition.

For some months a special commission of the Academy of Science in Moscow has been studying the enigma of the snowman. The members of this commission hold opposing views. Some think that the snowman probably exists and that he may be the last surviving relic of a bygone age—a man who would not have benefited from a favorable social and technical environment.

the others, he is simply a legendary character.

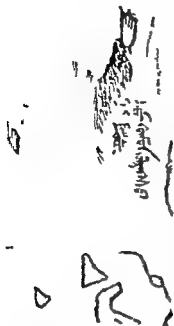
Two small documentary books prepared by the Moscow Commission show that beliefs which have or might have some relation to the snowman are scattered over a wide area. The question is to find out whether these are nothing more than beliefs.

As the Commission was reluctant to omit anything these two books include all the available documentation with the result that clearly plausible accounts are found side by side with facts which demand serious consideration.

Among the early accounts there are a few which are not entirely fantastic. Johann Schiltberger is apparently reliable for on returning to Bavaria in 1427 after traveling around Asia for nearly 30 years he quoted correctly the names of people and places.

He refers to a mountain which separates Siberia from a desert. These mountains which we now call the Altai were inhabited by 'wild men' whose bodies except for the face and hands were entirely covered by hair.

He also describes how the Genghis Khan will



Woodcut of a wild man  
by Dr Vizek a Czechoslovak  
zoologist to document the ex-  
istence of the abominable snowman

man as a gift and a little  
he writes  
I've been to this country and  
I've seen all these events and when  
I was with Tchelra the son of the  
I can ever thing with my own

Tchelra is a historical figure and  
his image was well placed as an  
it since after being captured  
by the Turks he was himself the  
the couple he mentions offered  
present to Edgell

### Evidence is Sketchy

Now we consider later ev-  
There is a paper written by

Prof Juntarino in 1930 which  
supports the Monodist belief re-  
garding the wild man but apart  
from the deeply rooted conviction of  
the author it provides no precise  
facts

Also Prof Rintchen of Lhasa  
Butor Monastery in a more recent  
statement in 1958 gives no direct  
proof but testifies to a tenacious be-  
lief among the Tibetans. Reports  
from Soviet soldiers guarding the  
frontier in the Pamir Mountains are  
rather confused but the soldiers  
are almost the only eyewitnesses  
who have supplied direct informa-  
tion for in the vast majority of cases  
the reports are secondhand. There  
are however two remarkable excep-  
tions

The first comes from Dr Kar-  
petian of the Soviet Army Medical  
Corps who found himself in the  
mountains of Dagestan in the Cas-  
casus towards the end of 1941. The  
local police consulted him about a  
strange man whom they had arrest-  
ed supposing him to be an enemy  
agent. This man was naked—in the  
middle of winter!

He writes Dr Karpetian  
undoubtedly a man but his chest  
back and shoulders were covered  
with dark brown hair whereas the  
inhabitants of that country have  
black hair. Moreover this hair was  
like a bear's fur and about two or  
three centimeters in length.

The man was about 6 feet tall.  
His skin was dark and he had neither  
beard nor moustache but fine hair  
covered the whole of his face. He  
had a large nose and a vacant ex-

A French anthropologist studies the evidence supporting its ex-

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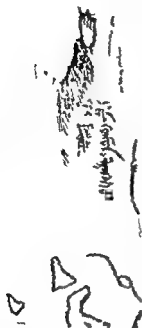
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As the Commission was reluctant to omit anything these two include all the available documentation with the result that clearly plausible accounts are found side by side with facts which demand consideration.

Among the early accounts are a few which are not entirely fantastic. Johann Schiltberger, a merchant, is reported to have returned from a journey to the East in 1271 after his capture in Persia. He is reported to have traveled around Asia for nearly 30 years. He is reported to have quoted correctly the names of many cities and places.

He refers to a mountain which separates Siberia from the desert. These mountains which well have been the Altai were inhabited by 'wild men' whose faces and hands were entirely covered by hair.

Schiltberger describes how the chief of the



shot a woodcut of a wild man  
by Dr Vizek a Czechoslovak  
archeologist to document the ex-  
istence of the abominable snowman

1 woman as a gift, and a little  
2 he writes

I have been in this country and  
of all these events and with  
with Tchekov the son of the  
I can everything with my own

Tch kra is a historical figure and Berger was well placed as an officer since after being captured by the Turks he was himself like a wild couple he mentioned offered a present" to Edigui

### Recent Evidence is Sketchy

Let us now consider later evidence. The paper, written by

Prof Juntcarano in 1930 which supports the Mongolian belief regarding the wild man but apart from the deeply rooted conviction of the author it provides no precise facts.

Also Prof Rintchen of Ulan Bator Mongolia in a more recent statement in 1954 gives no direct proof but testifies to a tenacious belief among the Tibetans. Reports from Soviet soldiers guarding the frontier in the Pamir Mountains are rather confused but these soldiers are almost the only eyewitnesses who have supplied direct information for in the vast majority of cases the reports are secondhand. There are however two remarkable exceptions.

The first comes from Dr. Karp  
petun of the Soviet Army Medical  
Corps who found himself in the  
mountains of Dikhestan in the Cam-  
casus towards the end of 1941. The  
1st author contacted him about a  
year or more when they had a  
telephone conversation in which he  
suggested him to be an expert  
agent. This man was naked in the  
middle of winter.

'He was' writes Dr. Hargrave -  
'undoubtedly a man but 20 years  
back and shoulders were covered  
with dark brown hair when the  
black hair of that combed  
like a bear's fur at  
three centimeters in  
length was 25

The man was  
His chin was dark  
beard nor mustache  
covered the  
half a face

pression his face had no ape-like characteristics however

He appeared to be incapable of speech. He took no notice of the bread and water put before him. From his excessive perspiration it was obvious that heat made him uncomfortable and therefore the examination took place in an unheated building.

Lastly this strange being was covered from head to foot with lice which belonged to none of the three species known to exist in that part of the world.

Was this man a real individual? How did he survive naked in the snow? What did he live on? These questions remain unanswered. It is a pity that Dr. Karapetian could not catch and preserve a few lice.

The second comes direct from China and is supplied by Prof. Koo Wai Loo, Director of the Second History Institute in the Chinese People's Republic.

This scholar acknowledges the existence of the 'primitive' man of the Himalayas but distinguishes him from the wild man of the mountains south of Shensi. This man differs physically from modern man only in his extreme hairiness. He lives in the cold mountains without clothes and as far as we know has no tools.

One of Prof. Koo Wai Loo's statements seems to imply that this man has no knowledge of fire nor—disputed—has he any knowledge of the spoken word.

Professor Koo Wai Loo also states that these wild men are quite common and that before the revolution

Chinese peasants hunted them like animals or kept them as slaves for they could be tamed and taught to do very simple jobs. In 1934 Koo Wai Loo himself saw one of the slaves. Though the creature spoke no language he had learned to repeat a few Chinese words and to do rudimentary tasks.

Here again the hypothesis of a pathological case might be put forward for after all the witness saw only one wild man. If we accept his statement that these men are quite common and were kept as slaves by the peasants until recently then remains the problem of identifying them. Who are these men who are perhaps not much more hairy than the Ainu (a race well known to anthropologists) but who cannot talk?

### Evidence from Folklore

The general impression received from a careful study of these two short books may be summarized as follows. The domain of the snowman or wild man extends over a vast territory stretching from Mongolia to Tibet and the Caucasus.

Some of the evidence provided by these books is almost certainly taken from folklore or legend with regard to which a certain amount of verbal similarity is noticeable. The *almas* of Mongolian legend correspond approximately to the *almas* or *almas* of Kabardino in the Caucasus. These beings though human in appearance are covered with fur.

Since there is no linguistic link between these two countries the geographical extension of the myth may

ably be explained by migration borrowing. The *almás* are also known of in the Pamir Mountains where another mysterious being the *alibon* is equally well known.

Further belief in giants, athletic ones or wild hairy men is very widespread extending beyond the territory of Asia. We find it in new as well as in the folk stories of Western Europe. But must we assume that folklore has no basis in reality?

A new argument in favor of the authenticity of the wild man or snowman has recently been suggested by Dr Vlcek, a Czech archeologist who has been working in Mongolia. A book published in Peking at the end of the 19th century shows many various illustrations of Tibet. It found a primate standing erect on a rock. This being is called a man animal.

A more recent edition of this book published in Mongolia shows the same being more humanized and now called 'wildman'. Dr Vlcek insists on it that all the other animals represented in these books are true specimens of actual fauna and not of imaginary beings. He therefore believes that 'both illustrations of the wild man document in a remarkable way the existence of this creature'.

But there is in fact only one illustration for the picture in the Mongolian edition is simply a modified reproduction of that in the Peking edition. Even the rocks on which the wild man stands are clearly copied from the original. The original picture looks like a some-

what stylized ape, it is the copy which looks more human.

Doctor Vlcek is an archeologist. Had he been familiar with anthropological literature he would perhaps have noticed that in Europe too early illustrators had an irresistible tendency to humanize monkeys. T. H. Huxley once reproduced some picturesque and amusing samples of these documentary specimens.

Doctor Vlcek points out that Prof. Rintchen has collected important documentation about other people's encounters with the *almás*. This is true. But so far as I know in spite of long and patient research Dr Rintchen has never met any *almás* himself. Once again it is a question of secondhand evidence.

As a biometrician I have been prompted to take statistics of certain details which appear in the various descriptions.

Though the figures are too small for a real statistical test, it is noticeable that in several independent accounts the hair of the snowman (or his local equivalent) is described as shaded brown, brown lighted with red, or reddish brown.

It is true that some other accounts describe it as gray, but again these are independent reports. It is not very much to go upon, but it may throw some light in the midst of so much uncertainty and contradiction.

On the whole the documents are unconvincing, but they serve to remind us of the okapi, the African animal which for a long time was thought to be an animal of Congo.



# Mighty Midget of Atomic Power



**A 200 pound nuclear reactor  
is scheduled for many chores**

*Condensed from Skyline*

**T**HE FIRST APPLICATION of nuclear fission power to provide electricity in space utilizes a 200 pound reactor which is about the size of a five gallon fuel can.

Designated SNAP 2 (Systems for Nuclear Auxiliary Power) the thermal reactor was developed by Atomic International under contract to the Atomic Energy Commission's Office of Aircraft Reactors.

Snap 2 is one of a family of systems for nuclear auxiliary power under development by the commission for space vehicles and is the first of the systems to employ a fission reactor as an energy source.

One of the big obstacles to the formation of a dependable link in the U.S. defense network has been the lack of a reliable longlife power source a satellite would have to carry for its instruments to justify the mission and the vehicle program costs.

would take some 500 000

U.S. \$ 100 000 000 by 1960 by 1965

pounds of chemical storage battery to supply for a year the few kilowatts of electricity required power the satellite's communications and data gathering system.

At present no U.S. rocket engine can boost anything like 500 pounds into orbit around the earth. However the Atlas boosted Agena and Centaur vehicles will provide the capability of several thousand pounds in the near future.

A SNAP 2 experimental reactor has been operating at full power for several months and it is still performing at design conditions. Successful operation is positive demonstration that nuclear reactors can be made small enough for space application and can at the same time produce power at high enough temperatures to be useful for efficient power conversion to electricity in a space environment.

## **Power for a Year**

The final system will operate unattended in the weightless vacuum of outer space and provide 3 kilowatts (3 000 watts) of electricity with an unshielded weight of about 600 pounds. The system shielded for a radiation resistant payload will weigh about 700 pounds.

With the shielding necessary to protect transistorized circuitry from radiation in an unmanned space vehicle the SNAP 2 system will weigh nearly 900 pounds. In a manned spaceship it would weigh approximately 2 400 pounds. At 2 400 pounds it could be utilized by either the Agena B or Centaur vehicle.

of the 2 400 pound manned power system can be considered for the Centaur and Saturn Centaur power systems

SNAP 2 is not a propulsion system. It is a compact nuclear reactor for satellites more than a year supply of electricity thereby adding longer useful life to large orbiting satellites.

The SNAP 2 system employs the same concept as ordinary steam electric plants with the exception that mercury vapor is used instead of steam and the cycle heat is released by radiation to outer space instead of to cooling water. The lightweight high temperature reactor is made possible by the use of enriched uranium 235 alloyed with zirconium metal hydride which serves as a fuel moderator material.

### Stains 61 Fuel Elements

The sensitive heart of SNAP 2 consists of a reactor core containing cylindrical fuel elements. The nuclear reaction takes place within the core to deliver 50 000 watts of thermal energy to a liquid sodium transfer fluid that travels through the core. The fluid enters at 1000° Fahrenheit and exits at 100°F.

This makes SNAP 2 the hottest little reactor so far known to the world. In the past few months it has operated continuously nonstop at a million degree Fahrenheit. Tubing carries the hot sodium to a boiler containing mercury, which vaporizes and drives a miniature mercury vapor turbogenerator.

The mercury vapor then goes through a condenser and back into the boiler.

This method is just a variation of a conventional vapor cycle—still the best method to use in space. A future development could be the elimination of the boiler and use of the heat from the nuclear reaction to vaporize the material right in the reactor. But this simpler system may be a long time coming.

A unique feature of the SNAP 2 power conversion arrangement is that it has just one moving part—a rotating shaft that floats on a pad of liquid mercury and drives the turbine generator and all pumps and bearings. This simplicity contributes to long life with no maintenance.

An electrical power plant operating at full power for one year in space might be compared to running an automobile at full speed for one year. Such an automobile would travel 500 000 miles or 20 times around the world without stopping for an oil change or a tank of gas.

Successful achievement of these technical milestones prompted the AEC to scale up the SNAP 2 system to furnish the increased power which will be required for future NASA space programs.

One of the advantages of SNAP 2 is that it can be stepped from 3 to 30 kilowatts with a little increase in size or could be scaled up to (500 000 watts) with a change in size and design.

Besides the virtues of compactness and lightness SNAP 2 is a low cost system. Its fuel consists of uranium that has been blended with zirconium hydride which permits the reactor to operate with a very low uranium inventory.

In this way SNAP 2 requires only one tenth as much expensive uranium for its initial charge as does a fast reactor burning the fuel in a pure state. This means the cost is also only about one tenth of the fast reactors.

In addition the SNAP 2 system will withstand the severe shocks, vibrations and temperature changes associated with missile launch and will not constitute a hazard to personnel, facilities or the general public.

The SNAP 2 unit will be instrumented to start or stop automatically on a radio signal from earth. When the satellite reaches its orbit the switch will be tripped and SNAP 2 will provide the electricity for another advance in space applications.

Atomic International has the SNAP 2 development about half completed. The reactor has been checked at full power and the power conversion unit developed by Thompson Ramo Wooldridge is also in working order. But the two still must be put together requiring additional engineering and testing. Finally performance qualification, reliability, environmental and endurance testing must be completed with the final system before flight tests will be initiated.

There are only a few known sources of energy for these vehicles that can possibly meet the endurance and weight restrictions required for space flight. They are radioisotope decay, nuclear fusion, nuclear fission reactors, and solar energy sources.

In considering these various sources it has been shown that radioisotopes are practical only to several hundred watts electrical output. Controlled nuclear fusion has not yet been achieved and does not appear practical in the next two decades. Thus only nuclear fission reactors and solar energy sources may be considered for higher power systems in the next 20 years.

Currently it appears that solar mirrors and boilers that could run a vapor turbine similar to the SNAP turbine system will be limited in application because of enormous cost and weight. In addition precise continuous facing toward the sun is required.

Large space vehicles now under development for 300 mile orbits such as Atlas Vega with a 50,000 pound payload, Atlas Centaur with an 11,000 pound payload, the Cassini Saturn vehicle with 25,000 pounds of payload and the 150,000 pound payload Nova must be more reliable to prevent costly failures and must operate usefully for long periods to amortize their extremely high initial cost.

Thus with the planned increase in vehicle capabilities, electric power requirements will rise rapidly for

few watts of today to many thousands of watts for the Saturn and its vehicles.

The progress made in developing SNAP 2, the first space reactor auxiliary power plant is a timely and important step toward being able to supply the large amounts of on board power these vehicles will need.

### Atom Needs 400 Watts

It is estimated that 400 watts of continuous electrical power are necessary to support the life cycle of the man in space and to provide him with the instruments and communications power he requires. With chemical energy it will require about 50 pounds of batteries for each day in orbit for the 2 000 pound Atlas Mercury vehicle which is to carry the Astronauts into space.

The 25 000 to 30 000 pound satellite boosted by the Saturn would

carry ten men for ten days using chemical batteries. But Saturn, using a 30 000 watt nuclear reaction system might be able to orbit ten men for a month or more.

When SNAP 2 goes to work, among its first jobs will be to power space stations and vehicles for deep space probes. With SNAP 2 and a Centaur or Saturn booster, such a probe should be possible in 1964.

A 30 kilowatt version of the A1 compact reactor should also be able to provide power for a small ion propulsion system giving a soft continuous push to a satellite already put into orbit by chemically propelled rockets. Ion propulsion (See, *Spaceships of the Future*, Nov '59) might be used to push a satellite already in an orbit 300 miles up into an orbit some seven times higher. A SNAP system might give an ion propulsion system muscle enough to take a vehicle to Mars. ➔

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However SNAP also has a big potential closer to earth. In keeping with the national programs, the thermal reactor may be used in world wide television relay satellites, and in communications weather and navigation satellites.

Communication satellites could broadcast with SNAP's 30 kilowatts of power at message costs comparable to those for overseas microwave transmission and less than those for transoceanic cable.

On earth the compact reactors

could be handily used where completely unattended sources of power are required such as in Arctic weather stations, remote radio beacons, navigation links, communications stations and underwater sonar nets.

The technology which went into SNAP 2 may also be used to build a portable power plant that could be transported by truck thus

## Gravity May Be Weakening, Scientists Say

SOME SCIENTISTS BELIEVE that gravity, the force that holds the world together, may be getting weaker.

If so, everybody is losing weight the easiest possible way. Unfortunately, the loss cannot be verified on bathroom scales. Even in a year the decrease would be far less than a millionth of a pound.

Speculation that gravity may be diminishing began more than two decades ago. It has been theorized that a weakening of gravity will cause the earth's circumference to grow slightly larger every year, widening cracks in the outer shell of the planet. The argument is strengthened by the recent discovery that one single fracture 45,000 miles long encircles the globe, the National Geographic Society says.

Scientists are eager to learn about gravity because it is the force that rockets and space ships must overcome to start their journeys. And gravity—the attraction of the earth's center for other masses—is a manifestation of gravitation, one of the most important powers in the universe. Every bit of

matter attracts every other bit, with the tiniest grain of sand exerting pull on the most distant star.

The National Bureau of Standards is attempting to measure gravity with greater precision by dropping a quartz rod down in airless tube. Scientists crisscross the globe with gravity meters to test the pull at various points.

These meters measure gravity in gals, so called in honor of Galileo, and break the measurements down into milligals. Readings vary slightly according to the earth's composition, a fact valuable to geologists.

Gravity is strongest at the poles because the earth is somewhat flattened there and thus the surface is closer to the center of the earth. Gravity is weakest at the equator, particularly in equatorial mountains, because of increased distance from the earth's center and the centrifugal force generated by the earth's spinning. A fat man can lose perhaps half a pound by moving from Washington to Quito, Ecuador.



Control Tower

New York's International Airport  
covers 4 900 acres  
has 22 725 employees

# Idlewild: Gateway To The World

by Bill Ballantine

Condensed from *Cosmopolitan*

AMERICA'S greatest aerial gateway  
New York's International Air  
better known as Idlewild has  
grown its adolescence and has in  
years become the world's busi-  
ness airport

Last year the huge terminal han-  
dled 214 298 flights carrying 6 994  
passengers—a daily average of  
more than 19 000 persons

In the past ten years Idlewild's  
passenger traffic has increased slight-  
ly more than 31 times. Cargo weight  
increased from nine million  
pounds in 1949 to 207 million last  
year. Idlewild's air mail business has  
grown too—from about 2 million  
pounds to 63 million. To handle this  
avalanche of airborne business  
725 workers are employed at the  
field (annual payroll \$153 000  
00)

Within a dozen years air travel  
will become the leading means of  
transportation between nations. In  
1949 for the first time more people

crossed the Atlantic in planes than  
on steamships. Now the Jet Age is  
here and Idlewild is ready for it  
thanks to sagacious planning by The  
Port of New York Authority, the  
bistate agency that operates the  
huge airdrome.

If you've not been to Idlewild  
Airport for a year or so you'll be  
astonished to see how it has changed.  
On what was once an expanse of  
tideland marsh flats a community of  
ultramodern architecture has been  
created.

Construction cost alone is ex-  
pected to exceed a third of a billion  
dollars. Figures and cost tags on a  
few of the existing installations give  
some idea of the immensity of the  
undertaking. A cargo center that  
covers 80 acres and has 300 000  
square feet of floor space cost  
\$5 300 000. A central heating  
refrigeration plant cost \$7 000 000.

The most significant  
Idlewild renovation  
program is of  
the new scene that

make it a  
new York

future traffic which forecasters have spotted at 12 million annually by 1965

### 655 Acre Village

A single terminal capable of handling such a traveler horde would need to snake out to an ungainly length—something like two miles. Therefore Idlewild's planners have created a distinctive passenger area, a 655-acre terminal village within the 4,900-acre city of Idlewild. In this compound major U.S. airlines will carry on operations from their own buildings; foreign flag lines will operate from the two large wing buildings; and a union terminal will house the rest of the airlines. The area's official title is Terminal City. Already in business on Terminal City's perimeter are the travel temples of several large United States Airlines.

Still very much in evidence—as frenetic untidy and claustrophobic as ever—is that much-criticized rabbit warren the Temporary Terminal Building ('temporary' since 1947). Eventually, this barrackslike eyesore will yield to progress and be replaced by a new union terminal.

Leading landmark of Terminal City and focus of the entire airport is the International Arrivals Building IAB to Idlewild's workers. Here are located the United States Health Customs and Immigration Naturalization Services and in the two Wing Buildings are the passenger depots of twenty of Idlewild's 22 foreign flag airlines.

IAB is an eight-wide three-story

affair of steel, concrete, glazed brick and glass. Its central main hall sports an enormous, heavily stressed parabolic roof surfaced with stainless steel and there are two Wing Buildings—east and west. The whole affair has a frontal stretch—wingtip to wingtip—of 11 blocks.

To the west of the IAB, steel girders and lining posts for the construction of Pan American World Airways' new \$10 million terminal stand skyward. The unique toadstoollike, cantilevered construction has been given the nickname 'umbrella terminal'.

An 89-foot wide air curtain will take the place of entrance doors to the glass enclosed main concourse of this three-level air depot. Jetliners will nose under the overhang of cantilevered four-acre roof to let passengers complete weather protection.

The excitement aroused by Idlewild's mammoth bumbershoot will be augmented by the new \$12 million terminal of Trans World Airlines (TWA) now coming in on the Idlewild flank. TWA's contribution is a startling concept in concrete (by distinguished architect Fero Sarraf) of functional realities of the jet age with the esthetic drama of steel slatted to be finished by 1961.

Sarraf's creation is a see-through building with great expanses of glazing, the lofty wingtips to extend. Opposite the IAB on the far side of Terminal City is American Airlines' new terminal large enough to process 4 million passengers a

able to service 16 jets simultaneously. The south is United Air Lines' home new terminal a completely conditioned crescent of aluminum and glass. It can accommodate thousands of passengers daily and 13 DC 8 jets as well as four prop aircraft at one time.

United Air Lines new home built in a concrete-capped forest of six and 50 foot pilings is the largest passenger terminal for a single airline in existence.

Nothing it over all is Idlewild's 11 tower, a stern rectangular reacher of steel and glass 11 stories high. Its tenth floor observation deck offers a spectacular view of entire lay out.

From the bevy of windows all of the city's most important buildings, aided by a weave of concrete ways that skirt oddly shaped islands studded with infant cypresses and hemlocks, are easily identified.

The roads are bordered by full lute-shaped lamp posts from the center of a huge circular pool a 916 jet fountain soars to a height of 60 feet.

A broad foot bridge leads from the road into the IAB's mezzanine where public lounges are on eye level. A stupendous Alexander Calder sculpture a delicately balanced cluster of colored metal paddles that floats in the upper reaches of the building's arched main hall.

In this area the IAB's shops lure the traveler with a plethora of services and accessories.

Customs Service operates

what it calls a "supermarket system." Incoming travelers bring their baggage by market hand cart to one of 72 stainless steel check out counters for brisk, brief inspection. This routine which used to keep arrivals fuming for hours, now is often completed in less than ten minutes.

Deplaning passengers are never mixed with those enplaning from the Arrival Buildings foreign flag depots which occupy the bulk of the building's space. Departing travelers are the world's most pampered for the international carriers seeking to outdo each other in the elegance of their passenger waiting rooms and ground accommodations have created ticket offices and lounges that are havens of heavenly comfort.

### Gold Plated Phones

At roof level is Idlewild's most ornate restaurant The Golden Door. It maintains a Sommelier Club for noted air travelers and has gold plated telephones that allow free calls to all airlines. Its menu a broadside as large as a small tablecloth is illustrated in full color and printed in six languages (English, French, Dutch, Spanish, Italian, and Russian).

The Golden Door's great expanse of windows gives an unobstructed view of three runways. For non-diners there are ten-cent turn-tilts outside this splendid eating house that lead to a 4,000 foot long observation deck.

Sightseers scrambling over the tarmac will find its size and archi-



might be impressive, but they are really delighted to discover the small city of Idlewild and its citizens. For instance, there's a chapel, Our Lady of the Skies, looked after by a monk from a nearby Queens parish. Regular masses are held and many have found it a romantic place to be wed.

Ground has been broken for a Jewish synagogue and a Protestant chapel is being planned. There is a full-size bank with several branches, a barber shop, dry cleaning establishment, laundry, haberdashery, florist and a newspaper circulation.

A great many people reside temporarily at Idlewild City's International Hotel, the only hotel in the world actually located on an airport. This pleasant caravanary specializes in small conventions, sales meetings and honeymoons.

### Air Fares Lower

In 1954 the average number of passengers per airplane was 13; today it is 31. The average miles flown per air traveler 15 years back was 547; today 615. People are not only flying more often but farther—and for less money. A comparison of fares between the years 1948 and 1959 shows a reduction of 26.6 per cent in the lowest available standard transatlantic fare—from \$350 to

millions of people flying has a conventional method of rather than a derring-do adventure fraught with peril. Last year 114 scheduled airlines flew

96 million passengers a total of 1,875,000,000 miles (this does include the figures for airline of U.S.S.R. and the People's Republic of China).

Air cargo is still only a drop in

freight carriers, the other is Pan Am and Seaboard & West has transported the U.S. Fleet team of 12 horses, four groomsmen, five riders in one cargo plane once carried 42 farm animals—sheep and pigs—to Nepal in a single plane.

The big drink between us and Europe no longer seems so big. Los Angeles is but a mere nonstop hop from New York. Jet flight means four and half additional hours to Hawaii, Paris 6 hours from Idlewild, London and one half.

United States airlines have ordered into 1962 a total of 232 pure and 81 turboprop jets, the bill will be roughly \$2,500,000,000 including supporting ground equipment.

### Safety Measures

Public security and safety guarded day and night by Idlewild's 85-man police force which automatically becomes a fire department during emergencies. Four fire trucks (fire foam carbon dioxide) on every alert from the Control Tower (117) alerts in 10 minutes any returning plane in view of the seriousness of the threat. Three of the trucks each hold

ns of water, 90 gallons of foam. fourth, called the "nurse truck," as the reserve 2 500 gallons of or 250 gallons of foam

Idlewild's cops made only 110 ar in 1959. There were no mur at the airport only five cases felonious assault and 23 dead on als Traffic summonses ■ 280 for parking the others for ders caught by radar patrol

### To Its Heart

e heart of Idlewild is the upper es of its Control Tower. Oper by the newly created F A A eral Aviation Agency) it is wild's supreme authority. Its n man shifts (plus a corps of ces) are not overawed by their nsibilities neither do they re them lightly. They simply face h task calmly and coolly with a fidence born of long experience trust in their fellow workers. More than a million dollars is in ted in the electronics equipment the tower and three separate reses of electrical power in ure un

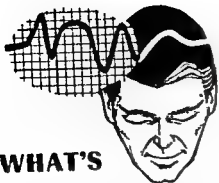
interrupted operation of the complex network, which is permanently staffed by 65 electronic and air traffic control experts

The jobs are too tough for women. Too much bucking the male animal all the time explained one of the supervisors. And too many precise decisions. This job would kill a woman. It's too difficult for many a man.

Ground control is handled from the topmost level of the tower called the cab—an octagonal room enclosed on all sides by a double wall of thick well-stressed glass of glare lessening pale green.

A few floors below is the Instrument Flight Rules room where seven men sitting in the semidarkness before twinkling radar screens track approaching planes and bring them safely to roost.

From the control tower planes are sent to the far corners of the world. Far corners? There are no more far corners. The world is truly round at last thanks to the jets—and Idlewild.



# WHAT'S ON YOUR MIND ?

## THE RIGID RULES OF THE OFFICE CASTE SYSTEM

Offices are ruled by rigid unwritten rules of protocol which freeze workers into castes then reach beyond the office to affect their families' says the magazine *Modern Office Procedures*, which bases the statement on an extensive survey.

'The caste system deeply entrenched, mocks one of business oldest legends that a company is one big happy family,' the magazine continues. 'This threadbare tradition is chanted with steady repetition. Companies say it, print it, lip-serve it, but don't believe it.'

*Modern Office Procedures* quotes one executive as saying "You've got to have discipline in a company. Someone has to give orders someone has to take them. If the relation between supervisor and subordinate is fettered by friendship the company loses."

The office caste system is hardest on supervisors newly promoted from ranks. They must sever their

friendships with their former workers. Says the personnel director of a large company, "If a man cherishes his old friendships he'd better not take the promotion."

The caste system also applies supervisors' wives and families. One executive said: "The wife has choice. She can be downright dangerous if she insists on keeping close friends with the wives of her husband's subordinates. Her friendship will rub off on him, color his judgment about the people under his jeopardize his job."

A personnel man states: "When parents drift away from former friends kids go too. Parents do say to them 'You're too good to go with Johnny now' but the father's new title and income make Johnny undesirable."

The magazine lists seven rules based on the composite experience of many management men by whom a new supervisor can break away from his former friends:



"1 Make the break gradual. A supervisor snips the cord to he'll build resentment."

"2 Find logical excuses for joining the group at coffee breaks, lunch."

"3 Visit the department by or card sessions occasionally at then more frequently."

- 1 Accept invitations at first to shames but reciprocate with group invitations. Then at all
- 2 Give employees the chance to away from the supervisor. A withdrawal from department activities by the supervisor lets do it painlessly
- 3 Give wives more time to pull from friendships with her husband's subordinates. "They don't retard the protocol of office organization a department head says, because they aren't exposed to it."
- 4 Let them make the transition slowly
- 5 Reduce all contact eventually since hours. But at all times be kind to everyone in the department impartially."

## ISOLATION

### BEHAVIOR

A normal person can be expected display neurotic behavior after as long as three hours in isolation according to Dr. Robert L. Vosburg, Pittsburgh psychiatrist.

Doctor Vosburg reported on an experiment where 15 volunteers placed individually in a sound room. Outside noises were muted, and sounds made within the room were absorbed by the walls making them muffled and difficult to criticize.

"The net effect of the experiment setting was to confront the subject with an ambiguous and strange situation and to deprive him of the ordinary ways to test reality, namely sense it, to explore it and to com-

pare ideas and feelings about it with another human being," Dr. Vosburg said.

Each subject was in the room for three hours. During the first hour the subject lay in darkness and silence. During one of the remaining two hours a shielded light was turned on. During the other hour the light was turned off and a small motor was turned on.



Doctor Vosburg said "The experiment evoked thinking and imagery that had it occurred in an ordinary setting, would be called 'irrational'."

A number of volunteers said they heard "falling rain," "a fly buzzing," "a bell ringing" and "a humming like 20,000 bees" when there actually was no noise in the room. Dr. Vosburg termed these "unmistakable auditory hallucinations."

The motor's humming noise prompted one subject to complain that it was making her teeth ache. Dr. Vosburg said this was clearly a case in which emotions were transformed into physical manifestations.

### PSYCHIATRIST LISTS "ACCIDENT-PRONE" ATHLETES

Doctor Robert A. Moore, a psychiatry instructor at the University of Michigan Medical Center, lists four major danger signals that



the clues are not strong incidental  
 although even though brief may in-  
 fluence the tone of the general per-  
 ception of the pictures meaning

#### CR OF ADEQUATE DEVELOPMENT CAN CAUSE ILLNESS

The concern women of all ages  
 particularly teen agers have over the  
 proportions of their bosoms can have  
 a pronounced effect on the individ-  
 ual's social and emotional behavior  
 an effect that can lead to illness

Dr Edward R. Pinckney an  
 internal medicine specialist of Bev-  
 erly Hills California

In an editorial in the *New Physi-  
 cian* an official journal of the Student  
 American Medical Ass'n Dr Pinck-  
 ney said As a sign of our times  
 the dimensions of women are re-  
 ferred on almost every page of our  
 newspapers and magazines given  
 prominence in the movies and on  
 television and have even become a  
 major topic for conversation

The young girl between 9 and  
 13 a competitive individual Dr  
 Pinckney continued and her great  
 concern is with her appearance  
 the need to be 'average' There  
 in our day and age it is a  
 bad sign when such a girl or her  
 mother consults a physician regard-  
 ing small breasts

If no congenital hormonal or  
 nutritional cause is found and if the  
 genetic factor seems within reason-  
 able the matter has been discussed  
 with the patient and parents the re-  
 sponse of a soft hearted mother  
 is the simplest and most  
 specialist

#### TELEvised HYPNOSIS CAN BE DANGEROUS

Televised demonstrations of hyp-  
 nosis can trigger serious emotional  
 reactions the American Academy  
 of General Practice warned

Doctor Paul Read chairman of  
 the Academy's Commission on Pub-  
 lic Policy said that closed circuit  
 studies conducted by the British  
 Broadcasting Corp have shown that  
 viewers thousands of miles away can  
 be hypnotized while watching TV  
 demonstrations The victims Dr  
 Read added may later require cor-  
 rective psychotherapy



The Academy urged that medical  
 associations and national television  
 networks establish ground rules to  
 eliminate television trance induc-  
 tions

In addition the commission rec-  
 ommended that hypnosis not be used  
 for entertainment purposes and  
 that it not be mentioned or re-  
 ferred to as the answer to common emotional  
 problems

Doctor Read pointed out that  
 hypnosis must be considered a psy-  
 chiatric tool and only part of total  
 psychiatric care He also deplored  
 the current parlour hypnosis fad

Only people who have had a de-  
 quate special training at accredited  
 schools or universities should at-  
 tempt to induce a hypnotic trance

show when athletes are 'accident prone'

1 Athletic ability is grossly out of proportion to the individual's willingness to be aggressive

2 A boy's aggressiveness or ability, ■ out of line with that of his father

3 An athlete is overly aggressive and lacks sufficient control of himself

4 A boy is overly timid

A boy who wants so badly to play but hasn't much ability or a boy with loads of ability who doesn't want to play very badly are both candidates for accidents. Dr Moore said



An athletic father who pushes his not too capable son into sports creates a hazard, he said. But it's just as dangerous when a boy's ability is much greater than his father's. This puts him in the potentially frightening situation of defeating his father."

The too aggressive player 'may rush blindly into the fray so he and his opponent are stretched out on the turf. And the overly timid may halt before being tackled and is likely to suffer greater injury on contact.

The boys I am talking about are not psychiatric patients. Dr Moore emphasized.

## SUBLIMINAL WORDS CAN SOMETIMES INFLUENCE FEELINGS

Under certain conditions subliminal techniques may strengthen the way observers feel about what they see. Two University of California researchers have found.

Psychologists Dr Michael Gestein and Dr Richard Bartholomew experimented with subliminal stimuli among groups of college students.

One group was shown slides of man figures engaged in some sort of activity. Positive words such as *success laugh happy*, and *love* were briefly superimposed on some of the slides.

In another group negative words such as *failure cry angry* and *love* were superimposed on the slides.

The same experiments were repeated in other groups with slides out of focus so that they were fuzzy but human figures were still identifiable.

Students in all groups were asked to tell a story about each slide. The stories were tape recorded.

Analysis of the stories indicated that in groups viewing slides in focus there was no apparent subliminal influence on stories about the slides. Among those viewing fuzzy slides there was an influence with the positive group telling positively told stories and vice versa. Subjects did not recall seeing the briefly superimposed words.

The UCLA psychologists interpreted these results to mean that when people are viewing pictures with strong visual clues subliminal messages do not get through.

He is also one of the few weather forecasters who believe that atomic and hydrogen bomb testing has an effect on the world's weather.

A tall, snow-haired man slightly bowed with his 88 years, Dr. Abbot is primarily a physicist. He studied at the Massachusetts Institute of Technology before coming to the Smithsonian in 1895. He is a down-to-earth scientist who would not predict the weather 24 hours in advance. He did not believe he stood on good scientific ground.

But while he has kept his feet on the ground, Abbot's eyes have been on the sun and in following it all over the world he has seen seven eclipses and visited nine of the latest stations maintained over a 3-year period for solar observation at the Smithsonian.

These stations accumulated an immense store of data from daily readings of the sun's energy of radiation and it was the doctor's analysis of this data that resulted in his official entry into the field of weather forecasting.

He studied the data for years and found the sun's heat varies over a period of 2 percent. Through these studies he found a family of regular cycles all relating to 22.1 years or 11 months, he says. "There were 5 periods which were exact multiples of 22.1 much as we have harmonics in musical sounds. I was excited to see if these related to weather and I found that they

With few exceptions, Dr. Abbot

says meteorologists who have also noted these variations have considered them too small to affect weather. But Dr. Abbot says, to ignore the sun factor in weather is like the playing of Hamlet with Hamlet's part omitted.

The relationship of the 273-month cycles to weather appeared so satisfactory on first inspection that the doctor decided to try some forecasting—but in a backward direction. He chose an American city with well-documented weather records for many years back, St. Louis. He studied the records from 1854 to 1957 and in them he found the same 273-month cycle as well as the related shorter periods. But they were magnified in precipitation by variations of as much as 40 percent above and below the normal rate.

The doctor worked tediously for three more years plotting curves and making his "brackets" to test his theory against what actually happened. He plotted the 273-month cycles and their harmonics, making corrections for factors that tend to affect transparency of the earth's atmosphere. These include population growth, industrial expansion, increase in oil burning, deforestation and desertification.

Then he plotted a graph of what actually occurred and put the two together on a 25-foot scroll covering the 103-year period. For out of the 103 his curves closely the record of

One of the int brought to light a



mospheric disturbances and great wars have always shown up as variations in the 27.3 month cycle as far as weather is concerned. The expected peaks and valleys still occur but in unusual times such as these the record of events falls out of step with the predictions.

The two world wars produced this effect as did the explosion of the volcano Krakatoa in 1883 which sent a cloud of dust circling the globe for years. There was another disturbance in 1952 which Dr. Abbot attributes to widespread nuclear bomb testing and the Korean war.

**T**HIS IS NOT the first system Dr. Abbot has devised for predicting weather on the basis of repetitive cycles. In 1942 he gained some note around Washington by printing a monthly leaflet forecasting the weather on a 27 day cycle. It was so accurate that he was called on to forecast a month in advance weather conditions for the inauguration of President Roosevelt in 1945 and President Truman in 1949. He predicted fair weather both times and scored perfectly.

In one summer 14 brides asked him to forecast weather for their

weddings. He continued these short range predictions until 1952 when he says the system seemed to fall apart. He says it may have been due to hydrogen and nuclear bomb testing but adds 'I

don't think they will affect the long range picture much. Ten years will have to pass before we can tell.

Doctor Abbot was consulted by engineers on the Tennessee Valley Authority project who wanted to know what the rainfall was going to be like in certain seasons since it would affect the job and the number of men needed. The doctor made a quick study of the area and predicted that rainfall for the period would be 84 percent of normal. As it turned out it was 87 percent normal.

In January 1948 in Washington Dr. Abbot selected 55 specific dates for the year when he said temperatures would drop to a minimum then start rising again. This was one of his early attempts to apply his system to temperature forecasting as well as rainfall. Between the coldest days he predicted there would be warmer days averaging 7.1 degrees higher.

Then he looked his predictions up against a safe. Early in 1949 the safe was opened by a Smithsonian official and the predictions were compared with the records. Out of the 55 months predicted Dr. Abbot was right on 43. The average excess on intervening days was 6.96 degrees against the predicted 7.1 degrees.

Like the forecasts that come from the U. S. Weather Bureau Dr. Abbot notes he carries no guarantees. He thinks he can be right at least

sible for the 27.3 month cycle.

I can't prove that it is, he says.

s no theory to prove it, even though the sun periods are perfectly and were observed simultaneously at widely separated points both hemispheres. This eliminates the possibility that local weather conditions may have been affecting observations of the sun rather than the other way around.

Now that he has completed his 32-city rainfall project, Dr. Abbott is applying his system to long range forecasting of temperatures

for 12 American cities. A new factor that must be considered here, he says, is that the average annual temperature in some areas has risen  $1\frac{1}{2}$  degrees since 1910. In this job, the doctor is aided by an electronic computer at Arizona State College.

Doctor Abbott now leaves solar observations and short range weather forecasting to the younger fellows. He still plays golf regularly, but when he wants to see whether or not to take his rain gear, he consults his newspaper.

PERCENTAGES ABOVE AND BELOW NORMAL PRECIPITATION FOR TWELVE AMERICAN CITIES INCLUDED IN A LONG RANGE FORECAST OF UNITED STATES PRECIPITATION PUBLISHED MARCH 23, 1960 BY THE SMITHSONIAN INSTITUTION WASHINGTON 25 D C

City	1960	1961	1962	1963	1964	1965	1966	1967
Albany, N. Y.	+40	+15	-3	-24	-41	+32	-8	+10
Cincinnati, Ohio	-16	+58	-22	+57	-62	+105	+16	-50
Denver, Colo.	+8	+33	-132	-34	+62	+4	+21	+37
Detroit, Mich.	+36	+8	-28	-44	-26	-15	+108	-7
Sacramento, Calif.	+76	+6	+22	-49	+8	+123	-56	-1
Salt Lake City, Utah	+31	-54	+16	-29	+11	+54	-1	-46
Spokane, Wash.	+72	-34	-28	-23	+125	+31	-5	-1
St. Louis, Mo.	+20	+72	-100	-40	-38	-44	+34	+41
St. Paul, Minn.	+17	+19	-44	-6	+45	-5	-40	+12
Washington, D. C.	+2	-31	-23	-21	+65	+48	-49	+26
Peoria, Ill.	+17	+34	-24	+5	+48	-22	+11	
San Bernardino, Calif.	-19	+13	-23	+8	-22	+113		

\*would apply also to San Francisco

\*\*would

# contact lenses

## Should you wear them?

by Jack Kaplan

**I**F YOU ARE one of the estimated 90 million people who wear conventional glasses you are considering or will consider the big switch—the change to contact lenses. Like most everyone who wears regular glasses you would like to discard them for one reason or another. I look Mom! No glasses you'd like to say.

The trouble is that you are muddled by the contradictory stuff you read about contact lenses these days. For one thing some mighty powerful ballyhoo is put out by a few contact lens manufacturers who claim the optical sky for their products.

One firm, for example, claims that it can fit lenses for \$29.95 in one sitting with "no tears."

any irritation or discomfort by all persons needing visual correction."

And a third concern states about its contacts: "Wear them up to six months without removing."

When you read that the Better Business Bureau and the Federal Trade Commission have cracked

down on these firms, pointing out that their claims are fraudulent and conclude that these get-rich-quick operators in the contact lens field care more for your buck than for your eyes.

For another thing, however, you know that Mary, at the office, and Joe your neighbor, either are wearing or are being fitted with contact lenses. You read glowing press reports that the contact lens field is making rapid strides and that "50,000,000 contact lens wearers are predicted by 1970."

You can't be blamed then for asking yourself: "How many of these claims about contact lenses are attributable to the rampant commercialism?"

How much is authentic health information that can help me decide whether contact lenses are for me?

### Extraordinary Growth

To begin with, it is true that the contact lens field is experiencing extraordinary growth. The average jet-propelled price in the last five years

In 1950 only 200,000 pairs were sold.  
(Continued on page 58)



## If you lose them...

by Ruth Boyer Scott

IF YOU ARE CONSIDERING contact lenses after reading the preceding article consider also how to avoid losing them.

If you're an average loser you'll learn from the experience of those who have lost contact lenses and get information about insurance on them.

A 17-year-old girl we'll call Jane was fitted with contact lenses. Jane is a proverbial loser. She and her parents decided that \$25 a year for insurance was too high and they didn't risk the \$150 to \$200 cost of new lenses.

One day she came home from her first in-school day wearing her contact lenses and went directly to the bathroom to remove them. Her mother happened to be in the room.

"What are you doing?" she asked. "I'm removing my lenses," Jane replied. "Before removing the lens from her right eye and putting it into the right side of her small contact lens box. Next she started to remove the contact lens from her left eye and suddenly howled in distress. 'Mother, it's gone!' And I told her that since I could see

sharply through my left eye a minute ago!" Mother and daughter made a thorough but unsuccessful search of the bathroom.

"My lens has to be somewhere!" Jane wailed.

"It must have slipped into your clothing," her mother said. "Don't move and I'll start searching you." She brought a sheet spread it on the floor and had Jane step into the middle of the sheet. Then garment by garment she undressed Jane carefully turning each piece of clothing inside out.

"Still no lens!" Jane was almost in tears and the tears welled into her eyes. Her mother handed her a paper handkerchief. Jane dabbed at her eyes and suddenly shouted, "I've found it! Sure enough there was the tiny missing lens where it had slipped under her eyelid as she started to remove it!"

Don was a happy but nearsighted amateur athlete who loved to play tennis, golf and go with the young crowd at the beach. He got contact lenses for insurance immediately. After a few weeks he was adjusted.

(Continued on page 10)

had ventured to pay \$150 to \$300 for these tiny vision aids which float on the natural tear layer of the eye and are invisible to the average onlooker.

Today the average price still remains \$150 to \$300 but according to the Eye Research Foundation of Chicago 6 1/2 million people purchased—and presumably wore—contact lenses in 1959.

Moreover the foundation predicts that by the time 1960 has run its course perhaps 11 million people will have discarded spectacles for contacts.

What has caused this big swing to contact lenses which today weigh no more than a feather?

About 85 percent of the men and women who switch to contact lenses make the change for cosmetic reasons—that is for the sake of appearance. Take for instance the case of Jane. "I hate to wear those horribly thick glasses," Jane told her optometrist when she visited him several months ago. She went on to say that her strong regular glasses depressed her so much that she rarely ventured out socially.

Feeling that Jane's motivation was a strong one the eye specialist prescribed contact lenses. Four weeks after she put them on Jane was able to wear her contact glasses without discomfort.

Today Jane is a happier girl. Con-

fident of her good looks for the first time, she gets around a great deal now—dates far more frequently than in the days of her detested eyeglasses.

## Most Wearers Are Women

Inasmuch as over 4 million of the contact lens wearers are women (practically all in the 15-40 age group) evidently a lot of vanity-motivated Janes are around. Among these are actresses and models—Metropolitan Opera's Patrice Munsel, TV's Peggy Cass, Hollywood's Debra Paget, Deborah Kerr, Arlene Southern and Esther Williams—who use their contact gadgets for professional reasons.

But it is no longer true as it was a decade or so ago that the actress-model contingent is the largest group. Today secretaries, typists and file clerks have discovered that "Mercedes," as Dorothy Parker observed, "can make passes." At girls who wear glasses, white collar workers outnumber by far their glamorous sisters as contact lens wearers.

A sizable group has turned to contact lenses in recent years for athletic purposes in both amateur and professional sports. A recent survey of 59 colleges indicated that 161 players wore contact lenses on the football field, 63 on the basketball court, and 91 in other miscellaneous sports. The entire Denison University basketball team wears corneal contact lenses as do several members of the Chicago Bears professional football team. So do gridgers Ray Berry and Kyle Ro-

---

Jack Kaplan of Brooklyn, N.Y., has written many articles on medical and scientific subjects for national magazines.

What's the reason for this shift in the athletic fraternity? Because contact lenses follow the eye and the absence of spectacles allows a more peripheral vision. This provides a great advantage in a counterbalancing the fact that contacts have been frequently lodged in the heat of competition. For a considerable number of beleaguered people contact lenses are an important occupational value because they do not steam up cloud with weather changes or streak in the rain. Consequently many seamen, policemen, jet pilots—outdoor workers in general who are wrapped up with the weather—have turned to them. So have some surgeons who have found steamed up spectacles a handicap in the operating room.

For whatever reasons people turn to contact lenses, those with common visual defects such as nearsightedness benefit most from the dramatic developments in the field. Consider the case of Mrs. R. S., age 40, with corneal scars due to childhood diseases. So limited was her sight that even with ordinary glasses her vision was only 27 percent that of normally sighted people. She dared not take a step without her glasses, nor could she move her daughter across the street. Finally, after long years of ineffectual treatment—in eye specialist after specialist—she was fitted with contact lenses. With the glasses Mrs. R. S.'s vision approached that of a normally sighted person. Technically speaking, the chief

reason for the amazing spurt in contact lens users has been the tremendous improvement in grinding, shaping and fitting the lenses.

### Concept Is Not New

Perusing optical history, we find that the concept of contact lenses is far from new. The many-faceted genius Leonardo da Vinci thought of it as early as 1508 and by 1847 some German opticians were producing lenses that were evidently effective for short periods.

Their basic lens was a scleral one—that is, a piece of glass shaped like an eggshell and covering up the front of the eye or sclera. But to hid Unsightly, uncomfortable and practically impossible to fit properly, scleral lenses were prescribed by eye specialists only as a last resort for visual defects which could not be corrected by ordinary glasses.

This type of lens persisted virtually unchanged for about 50 years. Then a scleral lens of plastic was produced in the 1930's. But whether of glass or plastic, these scleral lenses necessitated a special fluid which, after four or six hours affected the cornea temporarily reducing vision.

Then scleral lenses of a fluid type were developed that would allow the wearer's own tears free access to the surface of the eye. These fluidless lenses are still used today for special needs, even although their use is not as good as that of corneal lenses.

They resemble in the

came up with a smaller, more comfortable lens than the scleral type—the corneal lens intended to rest on the window of the colored portion (the iris) of the eye. By 1947, corneal lenses, only seven sixteenths of an inch across were available. Today, the overwhelming majority of contact lens wearers—about 80 percent—are fitted with a tiny corneal lens, about one third of an inch across, the size of a cigarette tip.

Superior to the scleral type in that they offer relative ease in fitting, better cosmetic effect and a wearing time of about 16 hours, corneal contacts have one important disadvantage. Their very thinness puts the new wearer through a real obstacle course of petty exasperations. (See companion article 'If You Lose Them' page 37 this issue - Ed.)

### Who Should Wear Them

Can you wear contact lenses?

That depends on two things: you as an individual and the skill of the specialist who fits you.

In general, Dr. A. S. Rosenberg, ophthalmologist, told *Science Digest* contact lenses are not for anyone with evidence of having prolonged or repeated involvement of the cornea. That is to say, if you have had a history of disorders like iritis, keratitis and conjunctivitis, then contacts are inadvisable.

Again, you may be a person with shut eyelids or a tendency for the mucous membranes lining your lids (the conjunctiva) to be easily irritated. You may have glaucoma or

cataract formation. In these instances contact lenses are not for you. Nor are they for you if you have the kind of nervous, strung temperament which will be able to adjust to the sensations caused by the lens in your eye.

Make no mistake about it, even if you fall into these categories you're in the minority. The great majority of people wearing contacts can wear contact lenses successfully.

But if you are one of the rest, you will find that adjusting to contact lenses takes time and patience. For some the 'break-in' period is as brief as a few days or three weeks, for others it may be as long as several months. On average, the patient should be able to adapt to the lenses in a matter of a few weeks.

Obviously, the 'break-in' period is crucial for most people. The chances for your escape from this period as a successful wearer of contacts depend upon several factors. Eye specialists call your motivation. The greater your desire or need for contact lenses, the better your chances. For contact lenses, after all, are a foreign body, so they will necessarily experience a certain degree of discomfort while wearing them. Unless your desire to wear corneal contacts is strong enough, you will probably be one of the estimated 15 to 25 percent who find contacts "too much fuss and bother" after a short trial.

Vital too is the skill and professional ability of the fitter. Consider the case of Mrs. C. K. 20, who after wearing spectacles for

decided that she must wear contact lenses. She turned to a contact lens outfit of doubtful professional integrity. Because the optometrist she dealt with hurried the fitting too much she found the corneal contact lenses he prescribed for her too uncomfortable, too irritating to the eyes. After a while Mrs. C. K. developed an abrasion of the cornea in her right eye. Today her contact lenses are put away in her medicine chest probably never to be worn again.

So imperative is a proper fitting that the American Academy of Ophthalmology and Otolaryngology and the conservative American Optometric Association are now shaking a strong warning finger at the public to avoid untrained dispensers. Too many people says Dr. Roenber, receive with these professional codes in connection with a bargain and they go to commercial outfits not scientifically trained. The result is that they are not fitted properly.

Whatever the problems of the contact lens field practically all authorities agree that it has come of age. Certainly today it features a number of current developments—the series and inventions which promise a healthy and successful future.

One new development is helping many people adapt more readily to contact lenses. One of the largest problems in the fitting of corneal contacts is the not-so-perfect edge resulting from the hand human process. An imperfect edge can irritate the lids riding over the lens

producing unpleasant lid symptoms.

Now a new automatic process—a scientific controlled edge finishing treatment—has removed the irregularity found on the hand finished lens. For the lens wearer, this means that the normal adaptive symptoms—itching and feeling that something is in the eye—is reduced to a minimum.

### Specialized Uses

Probably the most significant current development is the progressively more important role that contact lenses are assuming as a sight saver as an important therapeutic measure to correct visual defects. In addition to being eminently useful for the nearsighted—like Mrs. R. S.—a number of scientific studies give concrete support to the belief that contact lenses can reverse nearsightedness as well as act as a more immediate aid. Contact lenses are also used to help people suffering from astigmatism, farsightedness, cataract removal and trichiasis.

Astigmatism is caused by slight irregularities in the curve of the cornea—a condition which causes light rays to pass through the irregular cornea to be bent out of focus so that images become blurred. Contact lenses give a person an artificial spherical cornea which will fill up the irregular cornea so that his vision is greatly improved.

Contact lenses have—or nearly everyone after a few patient months—



lens to restore vision 'At least 60 percent of all patients operated on for cataracts Dr Jerome Weiss of Syracuse told a conference of contact lens specialists recently do not get comfortable vision from spectacles The modern contact lens is the only answer to those who have had one eye operated on for cataract'

The battle against trachoma has been given a real forward push by the contact lens field The disease usually results in blindness because the cornea becomes scarred and is like a frosted window The action of modern contact lenses Dr Alden N Haffner Executive Director of the Optometric Center of New York, told *Science Digest* prevents deterioration of vision by guarding against further damage to the cornea At the same time vision may be improved by the nature of the optical properties of the contact lens"

### Bifocals Next?

What about bifocal contact lenses—the newest development in the field? Until two years ago it was considered useless to place a reading prescription in the bottom of a contact lens because the tiny plastic disk resting in a shallow bath of tears rotated once or twice a minute Then optometrist Newton K Wesley

of Chicago came up with a solution: a bifocal contact lens with the distant vision prescription in the center, enclosed by a surrounding that corrects for closeup reading. Rotation consequently makes no difference.

Today all authorities agree bifocal contacts are still in the experimental stage although one estimate has it that about 1,000 people here and in England wear them. Some ophthalmologists—like Rosenberg—think them still impractical.

### Guideposts for You

If you do decide that contact lenses are for you then here are some guideposts:

Be sure mentally that you want contact lenses. Motivation really counts.

Pick someone—an ophthalmologist, an optometrist or other qualified eye specialist—who is reliable.

Make sure that you discuss thoroughly the matter of care of contact lenses with him.

Be sure that you are well fitted.

'After all,' says Dr Rosenberg of the last point 'fitting is important; you must be most careful about it. Poor fitting is the reason that many of the people who buy contact lenses never wear them. They then put them in their bureaus

### Man Lived in South America 10,000 Years Ago

MAN LIVED as a nomad in South America 10,000 years ago perhaps a thousand years earlier than thought. Recently two archeologists of the University of Oklahoma Museum re-

ported Profs William J. Mayer and Robert E. Bell said that they uncovered stone tools and other primitive-made objects estimated to be 9,000 to 10,000 years old in Ecuador.

# How the elements were named

the names  
the 102

ments so far discovered

by Alan D. Levy

ed are a conglomeration of words  
en from Latin and Greek in the  
ner of biological names of people  
d places names of mythological  
acters and names of common  
stances

Some elements have names which  
r be one of their properties  
le some were named through an  
vance of their true properties

Oxygen is an example of an ele  
nt given a name through lack of  
ficient knowledge about it. After

ph Priestly isolated the gas in  
14 Antoine Lavoisier proposed  
at it be called oxygen (from the  
reek words *oxys* acid and *gen* to  
born literally maker of acids)

ave Lavoisier was under the  
lthen impression that it was a  
reterary component of all acids  
e now know that Lavoisier was  
ng but the name remains as a  
lute to his work

Lavoisier was not the sort of a  
in to make one error and let it go  
t that so he made another less seri  
ous mistake. When Henry Cavendish  
d separated what we now know  
as hydrogen from other gases in  
1766 he burned it in the air and  
found that water was formed

Since he had done such a good job  
in naming oxygen Lavoisier came  
to the fore and put

new gas be named hydrogen  
(from the Greek words *hy*  
*dro* water and *gen* to be  
born literally maker of wa  
ter) because the gas had the  
property of forming water  
when burned in the air. The  
name was adopted and has  
survived

The fact that Lavoisier reversed  
the names for hydrogen is the one  
element common to all acids while  
oxygen is one of the two components  
of water has been forgotten

Of course not all of the elements  
were named for properties they do  
not possess. Two of the elements  
were given names that show that  
they were originally mistaken for  
other substances. Cadmium's name  
is taken from the Greek *kadmeia*  
calamine and molybdenum's name  
is taken from the Greek *molybdos*  
lead for they were believed to be  
these substances at first

## From Greek and Latin

A total of 14 elements take their  
names from the proper names that

from the Greeks are

**Arsenic**—from the Greek word *arsenikon arrenikon* meaning "yel  
low pigment because the arsenic  
salts with which the Gre  
worked were all yellow in

**Magnesium**—from the Greek  
*magnesia lithos* meaning  
magnesian stone

**Zinc**—the Greek word was  
referred to the

The Romans gave us the names of the elements *antimony* (Latin *anti monium*) *carbon* (Latin *carbo*), *silicon* (Latin *silicis*) *sodium* (Latin *soda* the Latin word also meant headache remedy, indicating that the Romans were familiar with the properties of sodium bicarbonate) and *sulfur* (Latin *sulphurum*)

## Anglo-Saxon

The Anglo-Saxons gave us our names for gold iron lead silver and tin all of which were their common names for the metals. The French are responsible for manganese their common name for the metal.

*Platinum* also belongs to this group. When the Spaniards were pillaging South America they discovered this metal and called it *platina* meaning little silver because its appearance was similar to that of silver. The name was taken into English as platinum.

## Superstitious Beliefs

Two of the elements take their names through superstitious beliefs about them. German miners when mining *cobalt* had their health imperiled by the fumes of the arsenic which was also present in the ore. Unaware of the true reason for the malady, they blamed it on a goblin or *kobold* and the metal became known by this name which was taken into English as cobalt.

The other element which earned its name in this way was *nickel*. Many years ago German copper miners would bring up an ore that they thought contained the metal

When this ore was smelted they extracted a metal that they believed to be worthless instead of the precious copper they sought.

They called this metal *kupfer nickel* (from the German word *kupfer* copper, and *nickel* Nick or demon) because they thought a demon was stealing copper from the ore. The word eventually shortened to *nickel* and carried over when the metal was found to be an element in 1751.

*Copper* itself is an ancient name that comes to us from the Roman. Rome's source of the metal was an island of Cyprus and they called it *aes cyprium* (meaning 'from Cyprus') at the beginning then shortened the name first to *cyprium* later to *cuprum*. When the Romans conquered Britain the name was carried over there and then taken into Anglo-Saxon as *copor* from which our name for the metal element is derived.

## Minerals and Rocks

Thirteen of the elements take their names from the minerals and rocks in which they were discovered: *aluminum* (found in alum) *barium* (found in the barites) *beryllium* (found in beryl) *boron* (found in borax), *calcium* (from the Latin word *calx* *calcis* lime in which it was found) *fluorine* (found in fluorite) *lithium* (from the Greek word *lithos* stone to show it was found in a rock) *nitrogen* (found in nitre) *potassium* (from the French word *potasse* meaning potash in which it is found) *samarium* (found in the mineral samarskite).

1 samarite) *strontium* (found in strontianite) *thorium* (found in thorite) and *zirconium* (found in the semiprecious gem the zircon) all names in this manner

The name of *bismuth* is believed to have been composed from two German words *z* is meaning white and *mat* meaning mass (literally a white mass) because of the color of the element

*Tungsten* had its name derived from Swedish in a similar manner is a combination of the Swedish words *tung* heavy and *sten* stone. It is named because of its high specific gravity

### After Their Properties

Nineteen elements are named in the same manner that biologists use to name new discoveries, names of Greek or Latin origin showing one of their properties

*Xenon*—this name is derived from the Greek *argos* inactive to show that it is an inert element

*Radium*—this is a radioactive element and its name is taken from the Greek word *aktinos* ray of light in reference to its power of emitting rays

*Polonium*—this too is a radioactive element and its name is also in reference to this property. Its name is derived from the Greek word *astatos* unstable because it breaks down into other elements through radioactive decay

*Astatine*—the name of this element is derived from the Greek *stas* is had smell in reference to its pungent odor

*Cesium*—this name is taken from the Latin *caesus* bluish gray in reference to the color of its spectrum

*Chlorine*—this name is derived from the Greek *chloros* light green to show the color of the gas

*Chromium*—because the element has salts with a variety of color its name is derived from the Greek word *chroma* color

*Helium*—this element was discovered spectroscopically in the sun and its name is taken from the Greek word for sun *helios* because of the way in which it was found

*Indium*—this name is taken from the Greek word *indikon* indigo because of the violet color of some of its salts

*Iodine*—the name of this element is derived from the Greek word *iodes* violet like because in the gaseous state it is violet

*Iridium*—because of the iridescence of its solutions the name of this element was derived from the Latin word *iris* *iridis* the rainbow

*Neon*—this name comes from the Greek word *neos* new because it was a new element

*Osmium*—this element was named for the irritating odor of one of its salts osmium tetroxide. Its name is derived from the word *osme* a smell

*Phosphorus*—because of the dark blue color of this element its name is taken from the Greek *phos* light bringer

*Radium*—this was

active element discovered, and its name was derived from the Latin word *radius*, ray, because it emitted rays

**Rhodium**—the name of this element is derived from the Greek word *rhodon*, a rose because of the rose red color of some of its solutions

**Rubidium**—the name of this element is derived from the Latin word *rubidus* red because of its red spectral line

**Technetium**—this element takes its name from the Greek word *technetos* artificial because it was the first example of the creation of a previously unknown element by artificial means

**Thallium**—this name is derived from the Greek word *thallos* a young shoot because of its green spectral line

## Mythological Characters

The element *mercury* was known to the ancients as quicksilver because of its property of being a silver colored liquid. As a result of this idea of quickness (actually free flowing liquid) it was named after the Greek god of speed *Mercury*.

Other elements are named in honor of mythological characters. *Promethium* is named after Prometheus, a demigod who made man out of mud and supplied him with fire. *Technetium* takes its name in honor of the Titans of Greek mythology. *Vanadium* is named after Vanadis, the Scandinavian goddess of love and fertility. *Yttrium* is named after Ytterby, a village in Sweden where the names of the elements were discovered.

## In Honor of Discoverers

Six elements are named in honor of people, but only one of them is named after its discoverer. *Cu* was named in honor of the Cu. *Einsteinium* in honor of Albert Einstein, *Fermium* in honor of Enrico Fermi, a noted physicist, *Gadolinium* in honor of John Gadolin, a noted chemist and *Mendelevium* in honor of Dmitri Mendeleev, the founder of the periodic table of elements. *Gallium*'s name is derived from the Latin *gallus* cock, a translation of the French word *coq* in honor of its discoverer, Lecoq de Boisbaudran.

Five elements were given names to show that they gave great culture to their discoverer.

*Dysprosium*—this element's name comes from the Greek *dysprositos* hard to get at.

*Krypton*—this name is derived from the Greek word *kryptos* hidden.

*Lanthanum*—the name of this element is derived from the Greek word *lanthanein* to lie hidden.

*Tantalum*—this element is named in an allusion to the mythological character Tantalus, who was punished by being forced to watch his children who were immortal. Above were fruit branches, however, the fruit always receded from him when he wanted to drink or eat.

*Xenon*—this name is derived from the Greek word *xenos* strange, in reference to the strange properties of this inert gas which made it difficult to liquefy.

The heavenly bodies have five  
 names named after them *Cerium*,  
*Uranium*, *Palladium*, *Plutonium*,  
*Lutetium* are named after Ceres  
 Pallas Pluto and Uranus  
 respectively

### Place Names

Nineteen elements are named  
 after places on the earth four of  
 them after the same city *Erbium*,  
*Ytterbium* and *Terbium* are  
 named after the city of Ytterby  
 Sweden

*Americium* and *europium* are  
 named after the continents of Amer-  
 ica and Europe *Berkelium* and  
*Californium* are named after the city  
 and state of Berkeley California in  
 the United States *Francium* and  
*Germanium* are named respectively  
 for France and Germany *Nobelium*  
 takes its name from the Nobel In-  
 stitute in Sweden where it was dis-  
 covered and *scandium* takes its name  
 from the Scandinavian region

The seven remaining elements in  
 this naming group have their names  
 derived from the Roman name for  
 places The city or country referred  
 to by the name is placed next to it in  
 the parenthesis *hafnium* (Copen-  
 hagen) *holmium* (Stockholm) *lute-  
 tium* (Paris) *polonium* (Poland),  
*rhodium* (Rhine) *ruthenium* (Rus-  
 sia) and *thulium* (from the Latin  
 word for the northernmost portion of  
 the habitable world)

Some of the elements are named  
 in reference to other previously dis-  
 covered elements *Protactinium* bor-  
 rows its name from the word

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### First Man Into Orbit

The month is September  
 The year, 1961 In the  
 blockhouse at Cape Can-  
 averal the communications  
 officer speaks into a micro-  
 phone "Are you reading  
 me in the capsule? Do you  
 have control of the ship?"  
 The answer "I'm okay I  
 have control of the ship A  
 pause, then "My God—  
 what an experience!"  
 Drawn from the new book,  
*Seven Into Space* this ex-  
 citing article describes  
 what it will be like for the  
 first Astronaut to make a  
 flight around the earth

### Victory Over High Blood Pressure

High blood pressure is not  
 a single disease, it is many  
 But victory over this di-  
 sease—or diseases—is com-  
 ing on many fronts says  
 Dr. Joseph H. Wesseling,  
 with the winning of many  
 small skirmishes and al-  
 most unnoticed battles

### Science Around The World

In his global journey  
 science, Sigmund Id  
 reveals for the fi-  
 the billion cause  
 superiority of the  
 Sputniks over ou-  
 er and Vanguard.

*proto* first added to the name of the element actinium because it breaks down into actinium through radioactive decay

*Radon* an inert gas takes its name from radium from which it is emitted and the *on* ending of all the noble gases *Selenium* from the Greek word *selene* the moon is named for its chemical similarity to *tellurium* which takes its name from the Latin *tellus* the earth *Viobium* which is chemically homologous to tantalum takes its name from mythology *Viobe* was the mother of *Tantalus*

The names of the two remaining elements have an interesting etymology. In 1885 Carl Auer von Wellsbach split what had then been thought to be an element into two new elements. The supposed element had been called *didymium* (from the Greek *didymos* twin) because of its similarity to the element lanthanum. One of the new elements was named *neodymium* from the Greek *neos* new plus *dymium* from *di*

*dymium*, literally meaning *didymium*"

The other new element was named *praseodymium* from the Greek *prasos*, green, and *dymium*, from *dymium*, literally meaning *didymium* because its salts are green

• • •

Thus we can see that from names of the first 102 chemical elements discovered we have no way of predicting what the name of the next element will be

Since the periodic table has space in it for 118 elements we can be reasonably sure that 16 more elements will eventually be revealed to us. But as to what they will be named we can make no prediction

As with parents and their children the problem of choosing a name for the next element is in the hands of the man or men who make the discovery. However, it is not a problem that will cause anyone to lose any sleep for as Shakespeare once said "What's in a name?"



### Approve Sale of Oral Contraceptive

THE U.S. FOOD AND DRUG ADMINISTRATION has given a drug manufacturer the right to market an oral contraceptive called Enovid.

Searle company said the pill has been tested on about 1,500 women in the United States during the past few years. He said none of those who followed exact directions became pregnant. Nor have there been any side effects.

• • •

According to Dr. Antwerp, who stopped taking the pills found were able to conceive readily.

It is available by prescription only, must be taken by a woman in doses of one a day for 20 days each month.

Lee D. van Antwerp of the

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the mother The need is for clear guideposts for the medical profession to define when an abortion is medically necessary

#### ISOTOPES USED TO TEST HEART DISEASE

A technique that may make it possible to predict susceptibility to heart attacks in persons showing no symptoms is described by Dr. Philip C. Johnson of Baylor University Hospital in Texas. He injects radioisotopes into the heart to test the rate at which the blood flows through it. In the diseased heart the blood flow decreased about 50 percent, he says.

Before the determination of coronary blood flow in the diseased heart involved a hazardous expensive procedure requiring installation of tubes or catheters into the heart. The need for a simpler diagnostic method has been great. Dr. Johnson says this method is simple, non-harmful and no more difficult to obtain or interpret than a simple x-ray examination.

#### STUDY SHOWS MEASLES VACCINE POSSIBLE

Immunity similar to that resulting from a natural case of measles has been produced by a live virus measles vaccine in a study involving 117 children.

Doctor Fred R. McCrumb Jr. of the University of Maryland told the Society for Pediatric Research that while there are unsolved problems the belief is the problems can be solved and that a measles vaccine

will be available for large scale use in the future.

The vaccine in test use has been administered into the nose and as an aerosol spray. These routes were found to be superior to injection into the muscle.



Doctor McCrumb noted that while the majority of those vaccinated had a mild infection for a few days there were no complications.

#### EIGHT OF TEN EPILEPTICS CAN HAVE SEIZURES CONTROLLED

It has been said that 50 percent of all epileptics can be assured their attacks can be brought under complete control. This is conservative, in the belief of Dr. Howard D. Fabing of Cincinnati. He believes that more than 80 percent of persons with seizures who are not otherwise incapacitated can now join the rest of the people of our society as 'normals'.

Epilepsy says Dr. Fabing is an old man and perhaps even convulsions can mean species which are the human. The stance which surface of of the din convulsions permit...

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Postell Park Memorial Institute, Buffalo, N. Y., for they suggest that the human body must contain some natural defenses against cancer.

It is conceivable the mysterious acting factors may be detected. Once identified they might be increased artificially or even borrowed to help who have been attacked by cancer.

#### DRUGS CAUSE FOUND JUDGMENT ERRORS

Widely used barbiturate can cause profound errors of judgment when taken in average doses, Harvard researchers report. Writing in *The Journal of the American Medical Association*, Drs. M. Smith and Henry K. Her said. The striking judgment distortion produced by the barbiturate is particularly important from the practical standpoint. "We can only wonder how many accidents occurring each year on the highway, in industry in the home and elsewhere are due in part to impairment produced by barbiturates (stimulants) tranquilizers and other drugs given to patients," they said.

#### WETTING CHILD HELP IT

Urologist says that the practice of waking the bed wetting child awakefulness at night or dragging him out of bed is unfair because it elicits the bed but not the child. Dr. S. Richard Muellner of the Indiana Medical School says the

problem of bed wetting is simply one of dimensions. The child's bladder is too small.

By age 4½ the child should double the bladder capacity he had at age 2, says Dr. Muellner. The capacity must increase to about 10 to 12 ounces before the child has a bladder big enough to hold the entire output of night urine and avoid bed wetting.

It is foolish to punish the child for something for which he is not responsible, the physician advises.

#### "JAGUAR CHEST" IS NEW AILMENT OF DRIVERS

Human beings who are jamming themselves into the new small cars may find themselves suffering from "Jaguar chest" or "Corvette hip," says a Chicago physician.



He reports in the *Journal of the American Medical Association* that he has seen four patients in six months who had developed pain in the chest, hip or back a day or two after they began using a small car.

The physician, Dr. Jerome F. Strauss, Jr., said the difficulty is not limited to persons six feet tall. One of his four patients was less than 5 feet 10 inches.

Abstaining from driving while usually relieves the pain, Dr. Strauss said.

# JUPITER

## the gas giant

by Alan E. Nourse, MD

*Condensed from a chapter of the book, Nine Planets*

SOMETIME within the next half century a fleet of spaceships will be drawing to the end of a remarkable journey.

You—a crewman aboard the spaceship—have been drifting out across the vast gulf of space beyond Mars's orbit and you know that when you reach your destination—the great planet Jupiter—there will be no warmth and welcome there. Jupiter beautiful and awesome as it may be is utterly alien. Mars, the moon, Mercury, even perhaps Venus at least have a superficial resemblance to your home planet.

But Jupiter is different. If you find yourself thinking of this great gas giant as a cold, dispassionate and implacable enemy to be conquered at any cost it is not surprising. Still, you cannot help wondering what this planet will be like, what may be found on its surface beneath the thick cloud layers.

The four gas giants—Jupiter, Saturn, Uranus and Neptune—are very similar to each other in many

details. On the other hand to the four gas giants, Jupiter, Saturn have families of satellites that are of particular interest.

### Earth Is Midget in Comparison

In size alone the gas giants are a class by themselves. Even

with a diameter of 71,500 miles even Uranus and Neptune are around 32,000 miles in diameter, closer in size to Jupiter than to earth.

Yet the density of these planets is surprisingly small for the density of the earth. The planets are not balls of solid rock orbiting around the sun. The gigantic size is the result of a massive gaseous atmosphere that clings to their surfaces. This blanket is extremely thick and heavy. Beneath it on each of these there must be a solid core, but although we cannot be large or small that core

Of all gas giants, Jupiter is the best. Jupiter was seen to have not one satellite like the earth nor even one like Mars, but at least four moons of quite respectable size. Few moons have been discovered periodically, until at present no less than 12 moons of Jupiter have been identified.

What we know about Jupiter is based almost solely upon what can be observed unfortunately in trying to interpret what they could see. Astronomers have been forced to draw a whole train of conclusions which may or may not be half-way about that planet.

Jupiter is usually visualized as an enormous planet making its slow ponderous way around the sun in a larger orbit carrying its family of satellites along with it.

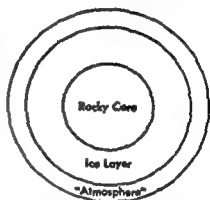
Because of its size it has been commonly assumed to have a powerful gravitational field. Yet for all its size the best guess at the probable surface gravity on Jupiter is only 2.6 times the earth's surface gravity, hardly a crushing force to contend with.

A more detailed look at what we now know about this planet helps to explain the paradox. Jupiter's diameter has been measured at 86,700 miles—approximately 10 times the diameter of the earth. But Jupiter's density is only 1.3 times the density of water, while the earth's is about 5. Obviously, what there is of the planet has more substance than Jupiter has.

No one knows just where the surface of "solid" Jupiter begins or

what the diameter of its core may be. But beyond question the surface is buried beneath thousands upon thousands of miles of furiously turbulent atmospheric gas.

It is this atmosphere and merely the outer layers of it at that, that astronomers have been able to ob-



A model of Jupiter according to Dr. Rupert Wildt, of Yale University.

serve. Most of what we know about the giant planet is based on this. But fortunately this atmosphere is not the blank featureless blur that Venus's atmospheric blanket is.

For one thing the planet seems to be banded with light and dark stripes which change in width and position from time to time. There is no question that these bands on Jupiter are atmospheric markings or cloud layers. The albedo (measurement of a planet's reflectivity) of a planet alone tells us that Jupiter is a planet covered with a thick, live, gaseous atmosphere. Jupiter's albedo is the

percent, as compared with Mars's 15 percent and Mercury's 55 percent. This compares favorably with Venus's albedo of 59 percent and with calculated albedos of the other gas giants: Saturn's 42 percent, Uranus's 45 percent and Neptune's 52 percent.

### • Like Huge Beach Ball •

At first it was thought that these band-like markings crossing the face of Jupiter and always lying parallel with the equator were merely the results of a stormy, turbulent atmosphere. But certain other things have been observed which suggest that something else has a hand.

Even with the earliest telescopes it was possible to see that Jupiter was not a perfect sphere but an oblate spheroid distinctly squashed at the poles and bulging at the equator like a huge striped beach ball that somebody was sitting on.

Now there is only one force that can flatten out a planet in quite this fashion and that is the centrifugal force at the equator caused by rotation of the planet on its axis. Astronomers concluded that Jupiter must be whirling on its axis at a furious rate of speed.

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Doct r Alan I No true practices medicine in North Ben l Wa b n t n He paid for most of his medical education by writing magazine stories His books include "You Want To Be A Doctor So You Want To Be A Doctor"

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This conclusion was supported very nicely by another odd surface feature on Jupiter, a prominent oval in the otherwise smooth pattern of horizontal bands which came to be known as the Great Red Spot.

Nobody could explain what the Red Spot really was. It was first noticed in 1878 a huge orange-pinkish oval on the beach ball in the northern hemisphere elliptical in shape and measuring 30,000 miles long and 15,000 miles high.

At first indistinct the Red Spot grew more prominent year after year.

With the planet so that astronomers could measure the period of rotation precisely.

As expected Jupiter was found to turn completely on its axis in 9 hours and 55 minutes. Then as these figures had been adequately confirmed the Red Spot began to drift slightly behind the rotation of Jupiter, and slowly to fade in color. It still visible though very pale as since 1890 has shifted in position through about one quarter of Jupiter's circumference.

Compared to this furious whirling on its axis Jupiter's progress around the sun seems ponderously slow. Since Jupiter's mean distance from the sun is 483 million miles its total journey in a single circuit is some 3,033,000,000 miles long. Because of Jupiter's greater distance from the sun it moves only 8.1 miles per second on its orbit compared to the earth's 18.5 and Mercury's 22.

Thus Jupiter requires 11 86 earth years to make a complete circuit of the sun.

The planet's moons revolve around Jupiter on a totally different scale, the closest one only 600 miles away makes its circuit in about 12 hours while the farthest away some 14 880 000 miles out from Jupiter speeds around the giant planet in a little more than two years.

These are the things which have been observed and measured on this giant its apparent diameter its relatively light density its thick atmosphere with the surface features that are peculiar to it its rate of rotation its motion around the sun and the behavior of its family of moons. But these things tell us little indeed about the nature of Jupiter's surface.

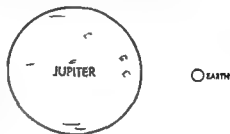
### ' Below Zero

There are a few other things that have been measured however indirectly. Thermocouple readings indicated a surface temperature of  $210^{\circ}$  below zero and with a feeble spark of a sun glowing a million miles away we are inclined to accept this measurement as a clue.

Spectroscopes have shown up no lines for hydrogen methane ammonia in Jupiter's atmosphere a blanket of pure potassium in the planet.

In applying what we know we develop a surprisingly good picture of what this giant planet must be like.

First of all, we can feel quite certain that Jupiter has a surface, somewhere beneath the layers of cloud filled atmosphere. Sober astronomers from time to time have toyed with the idea that there might not be any surface that Jupiter might be nothing but a huge gas ball. But Jupiter must have a solid core to have a density of 1.34.



Comparative sizes of Jupiter and earth

How large is the core, and what is it made of? How deep is the atmosphere around it? Where does the surface begin and how will it appear to our exploring parties, if exploring parties are ever able to land there?

A spaceship attempting to land on Jupiter's surface would be subjected to a frightfully powerful crushing force but it would not be gravity.

It would feel the full weight of the atmosphere above it—in atmosphere from 14 000 to 20 000 miles deep bearing down on the ship with a million times the earth's atmospheric pressure. This would be the crushing pressure the ship would have to withstand.

We can only guess at what a ship would see at the surface of the planet. It can't be down there.

violently turbulent atmosphere, it would find a thick glacier pack of ice thousands of miles deep and compressed to the hardness of steel under the weight of the atmosphere above it.

That glacier pack must long ago have robbed Jupiter's atmosphere of all its water vapor perhaps now is covered by a mash of methane and ammonia snow slush and vapor thousands of miles deep rising to give way to the thick clouds of crystals above.

Any ship even a thick heavily reinforced steel capsule would be in danger of being crushed flat as it probed down through the cloudy layers but if it could survive it might well have to sink through oceans of semiliquid methane and ammonia before reaching the solid core.

We can be certain that violent changes are going on in the atmosphere at the surface. There may be continuous surface upheavals violent electrical storms huge chemical explosions and volcanism.

The first goal of a future space ship will be one of the satellites of Jupiter. From a base camp on one of the moons drone ships could be sent down to probe the surface of the great planet first through the outer layer of atmosphere then deeper and deeper down toward the surface.

What those ships will find we do not know. Possibly they will find only a thick ocean of poisonous slush.

And if sometime in the future hu-

man eyes ever actually look out that surface, they will be staring at an inferno—a hellish landscape blazing hydrogen fires and boiling methane whipped by storms of violence that our hurricanes on earth will look like gentle breezes in comparison—a wild and utterly alien place, deadly to the existence of life as we know it and holding out every attempt to explore and exploit it.

### Is Life Possible?

From what we have seen of gas giants, it might seem for even to consider the possibility of life existing on Jupiter or Saturn the other massive heavy planets. Life of some sort could very well have developed there.

Certainly a basic building material could be found there the most versatile one possible. We know there is an abundance of carbon. Jupiter combined with hydrogen methane gas and probably bound up in carbon dioxide.

There is also an excellent universal solvent to be found there—water. All of the water on Jupiter is undoubtedly frozen solid probed down hard by the atmospheric pressure, and water in solid state is not very useful as a solvent in the way we understand the term.

But the two properties that make water such an excellent solvent are its use by living organisms in the temperature range—its ability to dissolve at least a tiny bit of nearly any other substance, and its ability

dissociate slightly (but only slightly) into ions—are not unique water. Other substances also have these critical properties and they serve as life-supporting solvents in the same fashion as water. If all such substances known now it could be more satisfactory under the proper temperature and pressure conditions than liquid ammonia as a possible reactant for oxidation-reduction reactions. Jupiter has oxygen in abundance compared to water, to say nothing of the bromine, fluorine, sulfur, and a half dozen other possible candidates.

Thus we see that all our basic criteria are fulfilled. But wouldn't the actual conditions we have seen in Jupiter—the bitter coldness and the immense atmospheric pressure—rule out any possibility of life developing there? Certainly they would rule out earthlike life surviving by means of earthlike chemical reactions. But we really know very little about the chemistry of extreme cold and extreme pressure—conditions cannot reproduce well in Earth laboratories. A whole body of research could conceivably occur under these conditions with the help of appropriate catalysts and enzymes. Without our knowledge of these reactions could be the basis of Jovian life forms.

But if life has occurred there, we can be certain that it is truly an interstellar form of life—a form that would be utterly impossible on an earthlike planet. It would have to be a life form that would

under enormous atmospheric pressures, possibly a creature to which such pressures were absolutely necessary for existence.

We could speculate that a life form living under such surface conditions might more likely be crystalline in structure like certain viruses, than protoplasmic or else equipped with a specially structured protoplasm that was able to thrive in conditions that would destroy the kinds of protoplasm we know.

### And Intelligence?

And if the appearance of intelligence is part of the evolutionary pattern of any life form, there would be no reason not to expect intelligence to have appeared there—but intelligence of quite a different sort from the kind that may have appeared on Mars.



Comparative sizes of four of Jupiter's largest satellites and the earth's moon. The other eight satellites are too small to be shown on this scale.

After all, our own intelligence is circumscribed and molded by our physical structure. We live in a 'shallow' tenuous atmosphere and obtain our metabolic sustenance from one of the gases in the atmosphere. Thus our equipment for respiration that would be most characteristic of Jovian life form



likely that such a life form would be equipped to soak up the reacting substances through a broad flat surface area.

Similarly, we are built long and thin with an endoskeleton supporting a soft warm blanket of protoplasm. On Jupiter a life form would more likely have an exceedingly strong exoskeleton to protect any soft parts it happened to have from pressure.

But there is no reason whatever to assume any kind of soft parts in a Jovian creature in the sense of muscle, nerve or brain tissue. Intelligence almost demands an integrated central nervous system with an electrical impulse relay system built in, but such a system does not have to be made of soft neurons, mushy brain tissue and pliable muscles. It could just as well be made of copper wire and porcelain insulators.

An organism need not even be mobile to have an integrated nervous system, although mobility is one of the characteristics of all intelligent life on this planet. The only major immobile life forms on this planet, the plants, are not even sentient as far as we can tell, much less intelligent.

We also believe that such refinements of physical structure as op-

we can be sure that it would be an alien life form unlike anything that we have ever seen on the earth and perhaps quite radically different from anything that we can imagine.

If there were intelligent life on Jupiter, what awareness could it have of the Universe about it?

If we agree that such a creature has a physical structure—and awareness—is molded by its environment—then an intelligent race on Jupiter would have to be as blind to the outside Universe as any creature arising on Venus. But there would be a difference. A race of Venusians might break perhaps even by accident free of the limits of the planet.

There would be every likelihood that an intelligent race on Jupiter would be indigenously planetbound. On earth we had to find a way to achieve an escape velocity of 7 miles per second in order to break free of our own surface gravity. On Jupiter the escape velocity would be on the order of 37 miles per second.

If we had to face an escape velocity of 37 miles per second here on earth rather than 7, it is doubtful that we would ever break free of the planet's surface. We too would be a planetbound race. Any creature that originated on Jupiter or Saturn or any of the gas giants would probably never even think of trying to leave.

There would be no way for it to develop the necessary technology to take the step into space—unless, of course, another race of creatures came along at some time to help

on Jupiter's surface we can speculate endlessly on the refinements of physical structure that might limit—or enhance—a developing intelligence. But whatever we speculate,

# SECRETS OF ANCIENT ENGINEERING

by Dr. George F. Carler

Not even the Indian engineers who built the massive fortress at Ollantaytambo could ever move it again.



Inca god, Ai opa

AT OLLANTAYTAMBO near Cuzco, in Peru stones weighing up to 75 tons were moved miles up and down mountains and across a river. Then they were carved as if they were no harder than a cake of soap, made to fit subtle curves of bedrock, stood on end and slid into a neat tight fit in massive walls. How did men do such things a thousand or more years ago?

Early men did this quite frequently. The pyramids of Egypt are made of huge stone blocks. Stonehenge in England has supercolossal stones. Easter Island has outsized stone statues seemingly completely beyond the ability of ill-equipped men to carve and move and set up. Did the ancients perhaps have some mysterious lost arts? Not at all!

An engineering study of the problems that the Indians of Peru solved many hundreds of years ago in order to move and carve and erect their gigantic stones shows that the methods used were age-old mechanical processes. They were skillfully planned as is true, but mysterious.

The fortress stands 100 feet above the town of Ollantaytambo. Its huge stones are made of red porphyry. This is our first clue. Where is the nearest red porphyry available? Five miles away on the other side of the valley across the sizable Vilcanota River and 2,000 feet above the river enormous slabs of this kind of rock lie at the foot of a great cliff. These natural slabs were the source of the stones for the fortress.

The skilled Peruvian stone cutters studied their rock, found its natural cleavage plane, determined the shape that they wanted and went to work. Using hard pointed stones they pecked a long V shaped notch along the line where they wanted the stone to split.

There was no mystery in this process. There was just plenty of hard patient work. Each blow of the hammer stone made a little pit in the surface of the rock. How long would it take to cut a rock in this way?

**I**F WE ESTIMATE that a workman might strike 50 blows per minute, and that one hundred blows might remove an ounce of rock, then one man would pulverize 30 ounces per hour, or 15 pounds of hard rock in each 8 hour day. In a week then, each man might well remove nearly

100 pounds of rock. Actually one seems to know just how much removed per blow. It is probably not less than 1/100th part of an ounce and it well may be considerably more. On softer rocks it must have been much more than on hard rock.

While the Incas had gained a good deal by going to a source where the stones were already free from bedrock, they paid quite a price for the distance that they had to travel the rocks. Perhaps this is fortunate for this lets us learn how they moved such massive objects.

Work was apparently abandoned while in full progress for there were partially cut stones at the quarry, stones in transit left where they were when work stopped, and a partially built fortress with partially finished stones sitting within it.

Distribution of the stones tells that the Incas used two methods of transportation. The stones at the quarry vary from 75 ton monoliths to little things of a mere three or five tons.

The large stones are evenly distributed along the road from the quarry to the fortress, but there are no small stones along the road. Apparently once a small stone started on its way there were no further stops. This suggests that they were carried.

'Small stones' weighed up to 10 tons. To carry such a weight the ancients put ropes around it and the use of long poles made it possible for large numbers of men to lift the object. It is a bit like carrying a man in a stretcher.

Doctor George F. Carter, an authority on the origins of American Indian civilization, has been a member of the Department of Geography, Johns Hopkins University, since 1943 and chairman since 1948.

If the 10 000 pounds of a five ton block were distributed so that each carried 200 pounds of rock and proportionate share of ropes and as it would take 50 men to pick and walk off with one of the small rocks. Apparently this was limit for the larger rocks showing that they were moved in an array.

It is estimated that the smaller stones those weighing only about one or four tons were carried the mile distance 2 000 feet down mountain side and across the river, and to the fortress in one day. There were 45 of them at the fortress to be given their final shapes. Work stopped.

The larger stones were distributed on a zigzag path that led down mountain side to a spot where river could be forded. The path

15 feet wide, and the largest stone on this path is 20 feet long, 12 feet wide, by three and one-half feet thick.

This 75 ton monster is almost as big as the path. Groups of men could not have walked alongside of struggling with its immense bulk loaded on carrying poles. Neither could so great a weight have been placed on sledges. Sledge runners would have plowed into the soft road surface. But how then?

Engineers reconstruct the problem as this. The soft surface requires a sort of support. They suggest logs were laid down somewhat in broad tracks. The stone then rolled along on rollers resting on these log rails. The soft surface

### Clay vessel in the form of a head



would then become an advantage, rather than a disadvantage, for the rails would sink into it sufficiently to spread the load out evenly.

The zigzag path becomes understandable also. Too steep a track would let the rocky behemoth slide out of control. On just the right slope with the rock up on rollers supported by log rails a string of men could ease these huge rocks along by using levers on them.

Steadiness was not the aim. It makes waste from the fact that the rock was taken in from the quarry and was taken to keep it up off the ground and could be moved by levers. When the stone was moved it was kept up on a set of that it could be moved more easily.

The following

the river was apparently accomplished in the same way. By laying logs down for tracks, and by rollers and ropes and levers, and plenty of manpower the massive blocks could be moved right through the river.

This was a danger point however, and the difficulties that even these master engineers ran into is shown by several great stones embedded in the stream at the ford.

Once the stones had been cut roughly to size carried down hill 2 000 feet brought across a formidable river and brought up hill to the fortress they were shaped to fit the particular spot that they were to occupy in the wall. They were made to fit like a hand in a glove. No mortar was used to fill the chinks and crevices. The stone was simply shaped all over so that it snuggled up to its neighbors. The fit is often so fine that after a thousand years one cannot insert even a knife blade in the crack.

We know how the stone was shaped. It was simply pecked away. We know that once the stone was set in place that it was impossible to lift it out and whittle away a little more. It had to be exactly right on the first try. Just how did the ancient engineers get such complex curved surfaces exactly right? And how did they lift the stone into its final resting place?

An educated guess on the fitting is that cruts were made of the surfaces of the rock that the block was to fit. Then the skilled mechanics could cut and try until the surfaces of their block exactly fit the crut.

It is an old mechanic's trick to blacken such a negative part as cast so that when it is tried against the positive part high spots are

**E**VEN IF the great stones were lying on platforms right by the place that they were to occupy, how were they finally set in place? Some of the stones there are like knobs left on their faces. These may have been left for the attachment of ropes, or as projections against which levers could be brought into play.

This last step we understand clearly. It must have been a delicate one. The stone had to be very carefully lifted and finally slid into its niche. There could be no slightest mistake.

Simple isn't it? The method is described slightly at Stonehenge and in Egypt and on Easter Island but the great thing is that simple mechanical devices and well known practices were applied with lavish expenditure of time and man power. It took great skill, fine organization, masterful planning and a will to accomplish a purpose.

As the mystery fades away our admiration of the men of the past is not diminished at all. Rather we must recognize that they were masters in the ancient and honorable profession of engineering. Possessors of no magical lost arts but having only the same basic engineering principles that we still use. The ancient used them with superb skill.

# Science Around The World

by Zygmunt Litynski

**IN 96 MOST IMPORTANT OBJECT** science grew out of magic and to have a rabbit out of a hat is still not much enjoyed by theoretical scientists. One of them, 39-year-old Y. Chiron of France, has now perfected such a peculiar act of scientific legerdemain: to put some of the world's best minds hard at work trying to make out whether this is science or witchcraft. Chiron, an engineer graduated from a great university in Paris and a diplomat, spent 5 years in Washington as science adviser to the French Embassy. More recently, as a researcher on atomic fusion at the Center of Nuclear Studies at Saclay, Chiron has pulled out of his hat the m<sup>96</sup>, a nuclear particle with the greatest mass of one thousand million millionths of an ounce, but probably the most important object in the whole universe for it may account for almost all universal being.

Chiron does not pretend that he has discovered the m<sup>96</sup>, nor that he has found experimental indication of its existence. The particle burst forth so to speak

from a set of equations worked out by the Frenchman with the ambitious aim of unifying the present disparate theories of nuclear, electro-magnetic and gravitational forces.

When Chiron's unified field theory first appeared in print in a Swiss scientific magazine at the end of last year it was ignored. The attempt to succeed where such giants as Albert Einstein and Werner Heisenberg had failed seemed somewhat foolhardy on the part of the obscure physicist. Moreover, though his equations tended to simplify all physical sciences, Chiron's mathematics were on a level accessible only to a small group of top experts.

The situation changed when more

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Zygmunt Litynski was born in Poland and educated in Austria and France. He began his career as a physicist but early

recently the strange calculations were put to a test by the use of an electronic brain. To everybody's amazement the computer proved that out of Charon's basic equation of the universe any nuclear electromagnetic or gravitational constant can be correctly obtained.

Then magic stepped in. In sciences it is not enough for a new theory to allow us to find out what is already known to be of real value, the theory must predict the unknown. This is precisely what Charon has done by deducing from his formula the existence of the meson 96 as a mathematical inevitability.

This is where we stand today. If Jean Charon's equations are correct the existence of the most important object in the universe is a certainty. But also if the meson 96 is now discovered the truth of Charonian physics—as it is already called—will be established. And this may mean the beginning of a new era in man's knowledge of nature.

### FRUIT THAT CURES ILLS

For about four thousand years amla (*Emblica officinalis*) a medium sized tropical tree with feathery leaves and small greenish yellow flowers clustered along its branches has been known to the populations of Pakistan, India and China for its legendary healing properties.

Amla's fleshy, astringent fruit is said to be antiscorbutic, diuretic, laxative and a vermifuge. It is prescribed for dysentery and typhoid fever. It serves also to produce a

highly appreciated heart and br tonic or a paste which when externally applied checks some mer diseases when not too far advanced. It can also be dried and employed as an excellent shampoo for the hair.

An infusion of amla leaves is used in dysentery or as a pleasant eye wash. Gonorrhea is cured by the juice from amla's bark. A ferment preparation from amla's roots is considered to be helpful in jaundice, dyspepsia. An infusion of seeds is recommended in diabetes, biliousness, infections and palsy. An ointment of burned seed is widely used against skin troubles.

These and many other medicinal qualities known to the Orientals since immemorial times induced Pakistani authorities to have the plant extensively analyzed in Lahore state laboratory. As Farruk Hassan Shah reports in the *Pakistan Journal of Science*:

That the tree may possess some really extraordinary properties is proved by the following data resulting from a systematic chemical investigation.

Dried powdered amla fruit contains gallic acid, ellagic acid, glucose, phallembric acid, emblicol and fatty matters. No alkaloidal or other physiologically active principle has been discovered.

Juice from fresh amla fruit contains 20 times as much Vitamin C as orange juice. Moreover while heating, drying or storage usually destroys most of other fruit's Vitamin C content in amla fruit it remains intact thanks to some undetected

ham in which prevents its oxidation and regeneration

### IT CELL NUCLEUS PHOTOGRAPHED

In the *Proceedings of the Indian Academy of Sciences* M. K. Subramaniam of Bangalore, head of the Genetics Laboratory of the Institute of Sciences, proudly presents the first photograph ever of a yeast cell clearly showing its cellular nucleus and its chromosomes.

How is this probably insignificant to the rest of the world? The photograph and Subramaniam's accompanying communication produced upon a small but widely known group of highly learned men the effect of a final and irrevocable event—the end of one era and the beginning of another. Some of them see the sum of their lives added to others; it is a mortal blow to why all the excitement? Because among yeastologists a bitter controversy has raged for well over a hundred years about whether the yeast has a nucleus or whether it has not.

Ever since Karl Wilhelm von Purkinje in the mid 19th century, claimed that he had actually seen a nucleus—a statement which was immediately hailed by some and immediately contested by others—these gentlemen have been brandishing their microscopes and defending their points of view.

Nothing in modern times, perhaps with the exception of Albert Einstein's relativity and Percival Lowell's canals on Mars, has caused so many harsh words in science.

Subramaniam's photograph is the

outcome of a general attack opened four years ago against the contention that the yeast cell houses its chromosomes within the cellular fluid without the use of a special membraned nucleus and valiantly carried on against tremendous odds by the Bangalore laboratory.

His job done, the Indian researcher explains now the reason for the confusion. Because of limitations of fixation and staining procedures, the yeast cell's nuclear membrane remains normally invisible. It may, however, become distinguishable—and in this way he has photographed it—when the cells are aged in the malt wort in which they were grown.

Another of the innumerable problems of nature is thus now solved and classified. And as science cannot consider the largeness or smallness of tasks but only truths and untruths, Subramaniam's apparently trivial discovery brings us one step further on the long way we have to go.

### CABBAGE'S DREAM COMES TRUE

What is a cabbage dreaming of? If it could speak, most certainly its answer would be: "To receive the proper amount of light—neither less nor more but just the exact measure needed for healthy and happy growth."

What would be the ideal method of making this dream come true? It surely would be to let the cabbage itself regulate the intensity of its wishes to have.

This is exactly what the R. I. will soon offer their vegetable



we are to believe a scientific communication in *Selskoye Khozaystvo* on the achievements of comrade Karmenov, a phytobiologist, expert in light physiology and semiconductor

What Karmenov has discovered is that plants do actually possess a mechanism by which they desperately stand though up to now without much avail whether they need more light or less. It works by reducing vapor pressure on the surface of their leaves when they require more sunshine for their photosynthesis and by building up vapor pressure when they are ready to carry out their life processes which are best performed in complete darkness.

Unfortunately the same is not true of the messages and this is a major reason for the much respected world shortage in the Soviet Union. With plants grown in darkness and a vacuum can hardly stand to let them out of doors for a market movement over flood plains. Then a range in during the day was necessary

stallation functions better than expected and agrophysicists are now putting it into general use.

What *Selskoye Khozaystvo* not tell, is what will be the final price of a Soviet scientific grown cabbage, after calculating costs of greenhouses, semiconductors, computers, servomechanisms, wiring, bulbs etc—not to forget appropriate state reward for Karmenov for his remarkable accomplishment.

### FORCE THAT MAKES MATTER LIVE

Another breakthrough announced also in France this time in biochemistry and physical chemistry.

In a communication presented to the French Academy of Sciences Francis Perrin Nobel prize winner and world authority on atomic and molecular physics three French researchers M. Polonsky, C. C. and P. Douzon described the experiments in determining the which endows chemical substances with the property of life.

According to their findings the force is *terroductivity*.

serves thus as the information and also by acting on the molecules of water as the information network. At the same time converted into mechanical energy it enables matter to put into effect the reactions it has itself collected and transmitted.

The three researchers cautiously and specifically identifying ferroelectricity with what was at a time called *lateral force*. But this is what communications seem clearly imply, this is also how it was immediately interpreted by a number of biologists.

An astounding aspect of the phenomena's investigation is the amount of importance they assign to an obscure phenomenon only previously considered to be merely a curiosity of nature. Ferroelectricity was discovered only in 1922 as an anomaly in Rochelle salt and was given its name because of its incorrect analogy with ferromagnetism. Then it was half forgotten until more recently when it was rediscovered in a number of other crystals by students of physics.

No satisfactory explanation of ferroelectricity exists at this time.

A hypothesis was advanced that the phenomenon may occur when molecules bearing two equal electric charges of opposite signs align themselves so as to give rise to a local electric field. The field then increases the molecular alignment and the alignment in turn increases the field. This was compared to the force which allowed Munchausen's soldier to lift himself out of the swamp by his boot straps.

Though still the best one we have, the above hypothesis was somewhat shaken when it was calculated that such an interplay of charges and field would at certain temperatures line up molecules in perfect parallel arrays. This is what science knew as the *Mosatti catastrophe*, in this case a disaster of the greatest magnitude for it would solidify all water on earth making life impossible.

It is most fortunate for the three French scientists and for the rest of us that in dealing with ferroelectricity physics or mathematics have proved so far to be erroneous. It provides speculation that something which was considered to be an anomaly of dead substance may turn out to be the long sought secret of life.

## Microbes Eat Jet Aviation Fuel

THIS THAT LOVE to dine on jet aviation fuel have been found and scientists are looking for ways to persuade them to desist.

Laboratory tests have shown that fungi and bacteria use the kerosene jet fuels for their own nutri-

tion. While living in the fuel, the organisms produce slimy and effluviolous material. All this is highly effective in clogging filters and tanks. Dr. J. H. M. Leonard of the Research Laboratory declares that the problem occurs in all large aircraft facilities and in the aircraft.



# Seven causes of **BALDNESS** AND WHAT TO DO ABOUT THEM

by Irwin I. Lubowe, MD

*Condensed from a chapter of the book, New Hope For Your Hair*

**B**ALDNESS is on the increase, relatively speaking among the white races. It is entirely reasonable to project the responsible estimate that, after puberty, 80 percent of all men and from 15 to 20 percent of all women will suffer a loss of hair ranging from "significant" to "undeniably bald."

Anthropologists have predicted on the basis of current trends, that in a century or so all men will be as bald as Baldwin apples, unless a civilized Utopia emerges. My own experience suggests that considering the even more dramatic increase of hair loss among men in recent years about 30 percent of them will be facing the problem of partial or

total baldness in the next decade.

Doctors and their male patients have heretofore yielded to baldness with a resigned shrug. They have regarded the phenomenon as an example of an unassailable, inscrutable fact. After all, it produces no physical pain, and no death certificate ever listed "acute baldness" as the cause of demise.

No one felt impelled to set up a well-financed research foundation to study the causes and cures of baldness. An appeal for funds for this purpose would be laughed into extinction because we have been conditioned for centuries to regard baldness as a subject for high humor. Most jocular about it as they secretly stifled a stab of chagrin are the blindest of men.

The increasing problem of hair

women will undoubtedly serve as an  
 ent spur to accelerate research  
 I women they will never patiently  
 lure baldness as some men do  
 they will agitate harass cryole  
 mulate and arm twist every rele  
 ant branch of scientific research  
 renewed effective action. They  
 ll be an irresistible force hurled  
 met a much less than immovable  
 ect

For the afflicted it may slightly  
 hunt the impact of baldness to learn  
 it is known scientifically by the  
 pressive term *alopecia* commonly  
 pronounced *alo peesh ya*

The word will come into more  
 mmon use with the rising popular  
 areness that physicians who have  
 etefore regarded loss of hair as  
 ther a hopeless ennui or a cul-

ldness yielding to scientific under  
 anding and a knowing approach  
 al proving to have been only tem  
 rary after all

There are broadly five specific  
 types of baldness, identified without  
 respect to their causes and classified  
 argely on the basis of visual ap  
 pearance (the single exception being  
 he form that usually accompanies  
 dvanced age which rather speaks  
 for itself)

They are

- 1 Early baldness (*alopecia pre  
 matura*),
- 2 Patchy baldness (*alopecia  
 areata*),
- 3 Baldness of the entire scalp  
 (*alopecia totalis*)

4 Baldness of the entire body  
 (*alopecia universalis*),

5 Old age baldness (*alopecia  
 senilis*)

Two categories of baldness, early  
 and old age are so alike in appear  
 ance—regardless of individual vari  
 ations in extent—that they have re  
 cently come to be known as pattern  
 baldness—a term which is now gen  
 erally accepted. Because this is the  
 heavily preponderant type of bald  
 ness it merits our foremost con  
 sideration

### Pattern Baldness Most Common

It has been responsibly estimated  
 that more than 90 percent of all  
 cases of baldness are of the pattern  
 type. This hair loss style is easily  
 identified either the frontal hairline  
 starts to move backward or a vi  
 cinity becomes evident on the rear  
 apex of the skull and starts to move  
 gradually forward

When the process is complete  
 regardless of whether it started in  
 front or in back the result is the  
 familiar horseshoe-shaped fringe  
 around the denuded crown. No  
 matter what extreme tactics of  
 combing are adopted to conceal it  
 or modify its appearance, it is still  
 pattern baldness

Generally speaking this most  
 common type of baldness gives der  
 matologists their greatest concern  
 because of its capacity for eluding  
 the efforts of researchers to identify  
 its cause. Pattern baldness is not  
 building when its origin is  
 in heredity. Fortunately  
 heredity is not its only c

Additional factors contributing to pattern baldness are

- 1 Excessive dandruff (seborrhea)
- 2 Nutritional deficiency
- 3 Scalp infections (such as bacterial)
- 4 Hormone imbalance
- 5 Impaired circulation
- 6 Scalp injury
- 7 Body infections or diseases

Since these seven factors are direct causes of pattern baldness, and since most of them can be remedied, their accurate diagnosis and skilled treatment offer better than an even chance for regeneration of lost hair.

As to seborrhea, there can be no doubt that this overactivity of the sebaceous glands which is the most common cause of excessive dandruff, is a prime culprit in baldness.

Doctors George Elliot and William Merrill British skin specialists, carried on an intensive study of 344 cases of premature baldness in their office and clinical practice. They concluded that 320 cases were associated with seborrheic dermatitis or dandruff. They also demonstrated that 203 cases, or 64 percent, occurred before the age of 30 when constitutional and body health are usually at their best, further suggest-

ing that local scalp infections are significant feature.

### Experiments With Animals

A matter of recent controversy has been the revealing disclosure by Dr. Peter Flesch of the University of Pennsylvania of his laboratory experiments with hair growth in animals. He rubbed the fur and skin of his animals with squalene, a substance normally present in sebum, the oily secretion in human hair. The animals lost hair, leading Dr. Flesch to conclude that it may be the excessive sebum which directly causes male pattern baldness.

However, Drs. R. Bloom and Boughton collected sebaceous secretions from men and women, both with and without a tendency to male pattern baldness, and found no chemical difference in their squalene content.

Doctors T. R. Wood and N. Nicolaides have gone a step further. They tested the total hair fats of three limited groups: six men, aged 22 to 30, with normal hair growth and no family history of baldness; four men, aged 24 to 29, with active progressing early male pattern baldness; and one man of 35 with complete baldness, the last five having family histories of hair loss.

They studied the fatty acids squalene, cholesterol, and alcohol factors, but found no difference in the relationships of these elements to the balding process.

Doctor T. B. Hamilton of the State University Medical Center in Brooklyn, N. Y., was one of the first

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ists interested in the field to test that excessive production of androgens the male hormones is an important contributory factor in pattern baldness. This conclusion has been fully supported by his study of males whose capacity to produce androgens is to say the least most limited—namely men who have been medically castrated at various ages.

In medical eunuchs castrated before the onset of puberty Dr. Hymowitz found no loss of scalp hair, never not even the normal recession of the hairline which occurs at least to some small degree in most men. He observed also a much reduced sebaceous secretion of the scalp and little or no dandruff. A loss of skin, however, was the only thing that if a eunuch were given regular doses of a male hormone such as testosterone propionate progressive baldness ensued in most cases if the treatment was terminated.

### Hormones Play Role

The point has been made that if androgens alone were the cause of baldness all men would be bald. Coupled with this is the undeniable fact that brothers will not necessarily be uniformly bald. Indeed, Dr. J. J. Moynihan, the British dermatologist, says that when a bald father produces enough sons to produce a reasonable sample, only half of them usually inherit his disposition to hair loss.

The obvious conclusion from this will be that heredity is only a partial factor in baldness. Never-

theless the conclusion could be hasty. It is my own observation that the truth is likely to lie somewhere in the middle—that what is inherited is a continuous overstimulation of machinery for the production of androgen and also the shape of the skull, another factor which influences hair growth. In eunuchs of course the process of androgen has been surgically interrupted.

In women a malfunction or overactivity of the adrenal glands and certain ovarian tumors will cause not only loss of scalp hair but other masculinizing effects including excessive growth of hair on the face, chest and arms where only men should have it. It has been conjectured too that balding women are likely to have bald fathers.

Everyone of course has heard at some time that wearing a hat especially a tight hat may contribute to hair thinning or loss. Dr. Benjamin Dorsey has commented that this practice causes balding and that while the process is slow in the end the tight fitting hat must triumph over a full head of hair.

He has described this type of hair loss as traumatic baldness, asserting that the tight fitting hat in time compresses and traumatizes the temporal artery and veins which run along the sides of the head permanently impairing the blood circulation needed to nourish the growth of the hair.

Doctor Dorsey says that heredity is an enormously important factor in hair loss but for a certain reason than the

suggested. His basic point is that you inherit the shape of your head and it is this bequeathed shape which determines whether you will be happily hirsute or hopelessly hairless.

### Why Eggheads Are Bald

The distinction is between the long narrow type of head and the oval shaped head. The former permits better circulation of the blood making its circuit freely especially as it goes over the cranium. But at the top of the egghead the blood vessels become pinched and the flow is blocked. Dr. Dorsey concludes:

This could be the whole scientific explanation of the greater prevalence of baldness in relation to eggheadedness. But there is another theory about it which could at least partly compensate the intellectuals.

Doctor M. Wharton Young, the brilliant anatomist at Howard University, has offered this theory as one of the conclusions from his study of the anatomical causes of baldness.

In brainworkers, he writes, the brain continues to grow through the fifth decade or longer, and many intellectuals are bald, but idiots and morons are seldom so.

Because the growth of the skull and other external coverings does not keep pace with brain growth says Dr. Young, in those with larger brains the blood vessels become pinched and provide less nourishment to the hair. The tension of the scalp increases and the fatty layer under the scalp thins, producing baldness.

Then with less prudence and scientific objectivity Dr. Young dares the wrath of more than a billion females with the observation: 'Primitive man was not afflicted thus (with baldness) nor do women with their smaller brains suffer the same fate.'

To show further that scalp tension could cause loss of hair, Dr. Young removed elliptical sections from the scalp of monkeys and stitched the remaining edges together again, thus tightening the scalp surface. The result was persistent baldness closely resembling the human types.

### Grandpa and Baby Look Alike

We have discussed the pattern type of baldness and the physiological causes that have been advanced for it by responsible researchers because it is by far the most common form of falling hair. Most of us start life hirsute and finish it in a balding pattern. The baldness of newborn infants is of the pattern type, which leads relatives to remark how much baby looks like Grandpa. He does, but baby will outgrow the baldness.

Pattern baldness is, of course, a matter of degree. A method of measuring such degree has been worked out. Dr. Hamilton classified 77 patients aged 25 to 59 in eight graded categories of pattern baldness.

Grades 1 to 3 would not ordinarily have been considered even remotely balding but there had unquestionably been some hair loss.

The ultimate Grade 8 had only horse hoe fringe of hair left. The standards thus established are useful for watching the progress of loss or of regrowth.

Three months after the 200 heads were first classified they were examined again objectively and with any reference to their previous classification. Remarkably 199 of them were classified anew exactly as they had been three months previously, the single exception was merely moved up from Grade 3 to Grade 4.

In his studies Dr. Hamilton attempted to set up a method for measuring the number of hairs in different regions of the scalp as well as of measuring their size and height. In the end, however, he concluded that this tedious analysis is less useful than regular inspection of the scalp as a whole.

While pattern baldness afflicts men and women of all ages, it is the one that attacks young men most often. It will start soon after the high year and the most callous physician cannot fail to be affected by the emotional distress it creates. A young man who detects a pertinent hair loss, however slow the loss, should at once seek complete physical and laboratory examinations for they can turn up unsuspected pathological causes which may hold the answer.

### Laboratory Checks

Hair loss, after all, may easily be a good faculty for removed from the scalp itself. The examination

should be directed to the possible presence of such pertinent organic factors as high blood pressure, heart disease, liver disorder, gastrointestinal abnormality and altered metabolism.

Laboratory checks should include a urinalysis, a complete blood count of the hemoglobin, red cells and white cells and a hormonal survey. The urinalysis should embrace a study of the ketosteroids, a highly complex chemical grouping of steroids in the urine which carries evidence of certain glandular functions related to hair growth.

Since the production of male hormones can be, as we have seen, so sharply pertinent to premature baldness, there should also be a careful analysis and evaluation of the male and female hormone balance.

While it is always possible that in the end all the functional tests will check negatively, the least feeling of despair should be resisted until the investigation is completed. There are now too many known reasons for baldness and too many known means of coping with it to warrant any other initial assumption than marked optimism.

### Control and Cure

If dandruff appears to be excessive as it so often is, it may well be seborrhea that is provoking the loss of hair and seborrhea is largely subject to control and cure. Any of a long list of scalp infections may also be at fault—a possibility that should not be discounted merely because symptoms are quickly visible.



untrained eye. A dermatologist can detect and attack them.

In the absence of any other suggestive findings, it is even possible in many cases that a local scalp approach will be of value.

This treatment consists of what may be called, for purposes of simplicity, "combined therapy." Such purely local treatment combines the hormones most often lacking the amino acids primarily responsible for tissue growth, oral vasodilators that open the blood vessels to permit freer circulation, and rubefacients (chemicals applied to the scalp) that send the blood coursing through those vessels.

All these strike at the principal

basic causes of failure of growth, and they can be effective combination even when the vital elements are not

• • •

One final word at this point as a last ditch resort, the procedure most commonly adopted to encourage regrowth of hair—close or frequent shaving of the affected is quite useless.

Cutting or shaving of hair on the head, face, arms, legs or armpits—does not encourage its growth in the slightest degree. Incidentally, in a fact which is put to rest the qualms of those who have been shaving off unwanted hair.

## Scientists Try to Teach Computer to Hear

ATTEMPTS TO TEACH an electronic brain how to tell one vowel sound from another are being made at Bell Telephone Laboratories.

Doctor J. H. Foulkes says the work is part of a continuing effort to make machines that can hear, understand and act on spoken command. Many of the sounds humans make when talking are classified as vowels. They are such sounds as 'a' in date, 'ee' in feet, 'i' in mine, 'o' in old and 'u' in cube.

Humans recognize these sounds correctly regardless of whether they are made by a child talking in a high squeaky voice or a man bellowing in a very deep voice. However, explaining the difference to a computer is difficult because no electronic 'brain'

has the mental abilities of even a part of the human brain.

Doctor Foulkes says that scientists think the differences humans hear in vowel sounds are due to 'resonance.' If you blow in a bottle you hear 'resonant frequency.' By blowing in two bottles at the same time, you hear two 'resonances' and their relationship gives the sound a distinguishable quality. In music such notes are called major and minor. They do not depend on the pitch of notes.

Scientists believe relationships between resonances are responsible for the differing sounds of vowels. Bell Labs are trying to classify these relationships in a way that a computer can handle.

ance  
zone



by Daniel Cohen

STROLOGER mystic and scientific genius Johannes Kepler was of these. He earned money casting horoscopes for royalty and he had a vision of the cosmos based on musical tones and geometric figures. From these far-flung speculations he drew laws which changed his view of the universe.

his strange and intriguing man was not born with the proverbial silver spoon in his mouth quite the reverse. Kepler's father Heinrich was a mercenary soldier and warrior who once narrowly escaped hanging. Katherine his mother, the daughter of a saloonkeeper, her old age was accused of witchcraft and nearly burned for the crime. Her aunt actually died at stake for being a witch.

Johannes was born on December 27, 1571 in Weil der Stadt, a free town of the Holy Roman Empire in what is now the southwest portion of Western Germany. He was a weak, month child and very delicate.

In infancy he began to manifest some of the health troubles which were to plague him for the rest of his

# Johannes Kepler



## the laws of planetary motion

When he was four, Johannes nearly died of smallpox. This however did not stop his mother who went off to join her wandering husband in the Netherlands where he was taking part in another war. Johannes and his infant brother Heinrich were left in the care of their grandparents for over a year.

According to his own testimony, Kepler's youth was a joyless one. He attended a series of grim and hard schools and his poor health remained a constant source of misery.

Life improved for Kepler, in 1589 when he entered the University of Tübingen. It was at the University that young Kepler first met Michael Maestlin, Professor of Astronomy, and the first great influence on his development as a scientist. Maestlin was required to teach astronomy according to Ptolemy, that is

sun and planets revolve around the earth. Maestlin however believed in the Copernican system which placed the sun at the center of the solar system. This belief he passed on to his most famous pupil Johannes Kepler.

Kepler had been a student in the theological school but upon completion of his work early in 1594 he was offered a Professorship of Morals and Mathematics in the Protestant school at Gratz the capital of Styria in Austria. Lutheran officials at Tübingen respected Kepler's formidable intellectual abilities and admitted that he possessed a deeply religious nature but they felt that his views were too unorthodox to qualify him for a regular church position.

THE YOUNG PROFESSOR age 21, somewhat reluctantly went to Gratz. There he became immensely popular with school officials despite the fact that his enthusiastic rambling lectures bordered on being totally incomprehensible and few students ever bothered to attend them.

The reason for Kepler's popularity was that one of his duties was to prepare an annual calendar of astrological forecasts. This was the traditional job of the Professor of Mathematics at the Austrian school. Kepler was lucky his first calendar contained some remarkably accurate predictions.

Kepler's attitude towards astrology was a two-sided one. Although he often made astrological predictions in his horoscopes he did this

for pay since he was always in need of money. He often damned astrology, calling it a 'dreadful superstition' and 'the foolish little daughter of the respectable reasonable mother astronomy.'

On the other hand, he once wrote in a letter to a friend 'Please take what I wrote you about astrology seriously. If I remember I have shown by systematic reflection as well as by examples that I do not reject it entirely. Astrology is of much more direct use to men (than astronomy).'

During his first years at Gratz Kepler began to engage in the cosmological speculations upon which his fame rests. The first fruit of these speculations was a book with the formidable title of *De Forcibus Motuum ad Cosmographica Tractatus*, containing the Cosmic Mystery of the admirable proportions between the Heavenly Orbits and the true and proper reasons for the Number Magnitudes and Periodic Motions.

This youthful work was wonderfully poetical wonderfully imaginative and almost completely wrong. In the *Cosmic Mystery*, Kepler was attempting to reconcile the new astronomical observation with his own ideas about the harmony and beauty of the cosmos. Unfortunately his factual observations did not fall in line with the geometrical scheme he had so cleverly devised he chose to ignore the facts.

About this time Kepler married. Nothing in life came easily to Kepler and marriage was no exception. His bride-to-be was Ursula

son Muhle-g a twice widowed noblewoman Barbara's prospects for a third marriage were not good yet her parents at first resisted the entreaties of Kepler and friends on the grounds that the hemetician's position was too low and his pay insufficient to marry Barbara with the life they deserved. But after long exhausting negotiations a match finally arranged in 1597.



Kepler's model of the planetary spheres they appeared in his first book.

Despite his efforts to win her, Kepler never really seemed to care for Barbara. He described her as being of a simple of mind and fat of body. She constantly complained about the financial hardships she had to endure and Kepler steadily ignored her complaints.

**D**URING THE LAST YEARS of the 16th century Europe and especially Germany was torn by religious conflict which had begun with Martin Luther and resulted in that disastrous and agonizing conflict called the Thirty Years War. No one was affected by the struggle more than Kepler. He was among the first

Persecutions of Lutherans in the Austrian provinces increased and finally in September of 1598 Kepler and other Protestant intellectual and religious leaders were exiled from Gratz.

Kepler was treated with more consideration than many of his fellow Lutherans. The Archduke of Austria had been pleased with the astronomer's work and many of Kepler's Catholic friends felt sure that he would convert. Although such a move would have made his life easier the idea never seriously entered his mind.

Later in life Kepler was to fall into serious trouble with members of the Lutheran clergy but in his own mind he always remained a devout, if somewhat unorthodox Lutheran. He wrote 'I am a Christian the Lutheran creed was taught me by my parents. I took it unto myself with repeated searchings of its foundations and with daily questionings and I hold fast to it. Hypocrisy I have never learnt. I am in earnest about Faith and I do not play with it.'

Kepler was allowed to return from exile after only a month but he knew that his days in Gratz were numbered and he began searching for a new position. He wished to work with the Danish astronomer Tycho Brahe a world renowned observer of the stars and the possessor of the finest collection of astronomical instruments in the world. Over the years Tycho had accumulated a large number of observations of the stars and

But Tycho with his eye on his future fame guarded his treasure closely while every astronomer in the world including Kepler tried to get it into his hold of it.

Tycho had been appointed Imperial Mathematician to Emperor Rudolph II and took up residence near Prague in 1599. There a meeting between the two was arranged.

Tycho was already an old man when the two met. He had spent a lifetime in painstakingly careful observations of the heavens. He had devised his own plan for the solar system and rejected the Copernican view that Kepler subscribed to. But Tycho recognized the young German's genius and hoped to use it to enhance his own fame. For his part Kepler was not the least interested in Tycho's fame but he was deeply interested in Tycho's observations.

Kepler was never really happy while under Tycho. The pay was too low, the position too lowly and worst of all the careful Dane refused to divulge any more of his treasured observations than he had to. But their association was not to last long. Fifteen months after Tycho and Kepler first met the great Danish astronomer died. A short while later Kepler was appointed Tycho's successor.

After Tycho's death Kepler simply swiped his observations or as he put it "I confess that when Tycho died I quickly took advantage of the absence or lack of circum-spection of the heirs by taking the observations under my care, or perhaps purloining them."

The next ten years were to be the most productive and trouble free in Kepler's life but a trouble free life for Kepler would have been a period of endless annoyance and agony to most other people. There were constant fights with Tycho's heirs over Kepler's right to possess the observations.

KEPLER also had a running feud with the court treasurer from whom he tried to collect his salary. This struggle ended in a draw.

Then there were illnesses, real some imaginary for Kepler was a great hypochondriac. As a result of all this Kepler was plagued with the need to cast horoscopes and make many other foolish and time consuming astrological predictions for friends and members of the court.

Through it all he still found time to give a good deal of attention to his main scientific speculations. He published many small works including an excellent book on optics in 1609 after years of struggle to get money for printing costs. He published *The New Astronomy*. The great volume contains the first of Kepler's three planetary laws upon which his fame rests.

Kepler's first two laws are: Planets travel around the sun in elliptical orbits with the sun at the focus of each ellipse. 2 Planets do not move at a uniform speed but in such a manner that a line drawn from the planet to the sun always sweeps over equal areas in equal time.



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Johannes Kepler

1630

to the modern mind these laws are deceptively simple but in the fall of 1609 they were revolutionary and formed the basis of an entirely new concept of the solar system.

Like the first law, for example, thousands of years men had believed that the planets moved in circular orbits. Why should the noble planets choose to move in an undisciplined elliptical path when a perfect circle is so much more attractive and pleasing in the sight of God? Besides, circles were good enough for the ancients. Thus ran the thinking in the early part of the 17th century. While observations of planetary motion were still crude and limited, circular motion could perhaps be proven. But when the power and accuracy of the observations improved, the circular orbits came more and more to conflict with observable facts.

Obervious who had thrown out

the idea that the sun revolved around the earth could not shake the circles. He and many astronomers postulated a wide variety of wheels within wheels to make the facts fit the circles. Even after Kepler had expounded his law of elliptical motion as great an astronomer as Galileo refused to accept it and died clinging to the idea of some form of circular motion.

The year 1611 was a disastrous one for Kepler. Civil War and epidemics brought Prague to a state of near panic. In the end his patron and protector, Rudolph II, abdicated. That year also saw the death of Kepler's wife and favorite child.

Although Rudolph's successor confirmed Kepler's appointment as Imperial Mathematician, the new ruler had little time for a court astronomer, and Kepler, who always had difficulty collecting his salary, felt that he had better get on his feet. His new position was

orship in Lintz the capital of Upper Austria. It was similar to the job he had held at Graz.

Here too Kepler got into trouble. His strong but unorthodox religious views resulted in his being excluded from Lutheran Holy Communion services in Lintz. This was a serious thing for the astronomer whose social reputation and good standing in the community were considerably hurt by the exclusion.

In 1615 Kepler was forced to undergo still another personal tragedy. His mother was accused of witchcraft. The proceedings lasted six years. During that time Kepler exhausted himself physically and financially in an attempt to save her. Finally in 1621 after the aged woman had been repeatedly imprisoned and threatened with torture he was acquitted and released from prison. Six months later she died.

The happiest feature of Kepler's personal life during his last 20 years was his second marriage in 1613. He went about choosing a second bride with the same scientific thoroughness with which he discovered his planetary laws.

He had 11 candidates to choose from and he carefully listed the qualifications of each one. In the end he chose the fifth of the 11 the only girl all his well meaning friends had advised him against.

She was Susanna Reuttinger and was 23 at the time of the marriage whereas Kepler was 41. She was an orphan and had been brought up in the household of a baroness where

she held a lowly position. Kepler's choice was an excellent one. For the remainder of his life he let her barely mention her and since it was his habit to reveal all his complaints in his correspondence it appears that he got on well with Susan. She bore him seven children of whom four lived.

Despite all his hard times Kepler managed to publish a second great book in 1618. This was *The Harmony of the World*. In this work Kepler tried to combine music, geometry and astronomy into a grand conception of a sublime and symmetrical universe. Almost 400 years ago Kepler's third law stated that squares of the periods of revolution of any two planets are proportional to the cubes of their mean distances from the sun.

During this last period in Kepler's life he published a large number of books, pamphlets, calendars of predictions and other scientific and pseudo-scientific works in order to get enough money to keep his family together. Among the variety of publications are two more excellent works *The Epitome Astronomice Copernicanae* and *The Rudolphine Tables*.

The *Rudolphine Tables* were a compilation of Tycho's life-long observations. They were named in honor of the Emperor Rudolph who had been both Kepler's and Tycho's patron. The tables had been anxiously awaited by scholars, map makers and navigators since Tycho's death but Kepler was reluctant to

the mammoth task of preparing the mass of data for publication. On one occasion he wrote "I believe that my friends do not send me entirely to the treadmill of mathematical computations and save me time for philosophical speculations which are my only delight." At the age of 50, nearly 23 years after Tycho's death, Kepler finally led down to serious work on the tables. By the time they were ready for publication, The Thirty Years War had reduced much of Germany into chaos and the already difficult job of printing such a complex work was even more difficult. First Kepler and his Protestant friends were nearly exiled from Graz for refusing to embrace the Catholic faith. Because of his fame, the important work in which he was engaged, the astronomer and his family were exempted from the general ban on Lutherans. But he was exempt from harassment.

In 1626 the Lutheran peasants rose in revolt and besieged Linz. Finally fighting broke out in the town and Kepler's press and all the tables printed up to that time were destroyed. This did not bother Kepler as much as might be expected for he had never liked Linz and was anxious to find an excuse to leave it. Kepler found another printer at Prague. There, after the usual fights and half-hearted reconciliations with his sensitive printer, *The Tables* were finally completed in September, 1630.

In the way Kepler was again without a real job. He had been offered several excellent positions in other countries but felt he was too old to leave his native land. He became private mathematician to Wallenstein, the romantic hero of the Thirty Years War. But Wallenstein only wanted the famous astronomer as a showpiece and was not much interested in science. Like so many of his other patrons, Wallenstein too refused to pay Kepler what he had promised.

Fearing poverty and old age, Kepler took to the road again. In October 1630 he left Wallenstein's estates in Sagan and borrowed enough money to get to Regensburg, where the Emperor was presiding over the Reichstag. He was going to try and collect the 12,000 florins the crown owed him. He arrived in Regensburg on November 2 and three days later was stricken with a fever. He died on November 15, 1630.

He was buried outside the walls of the city. The stone carried an inscription that Kepler himself had composed for the purpose:

*Once I measured the skies  
Now I measure the earth's shadow  
Of heavenly birth was the measuring mind,  
In the shadow remains our body*

Three years after his death, the cemetery outside Regensburg was completely destroyed in the war. Not until 200 years later a monument in honor of Kepler was placed at the place.



The way a person signs his name provides an insight into his character

John Gibson  
J. Gibson  
J. Eppingham Gibson  
J. E. Gibson

John Eppingham Gibson

**Your signature shows you up!**  
by John E. Gibson

PSYCHOLOGISTS have found that your name how you feel about it and how you put it down on paper reveal a great deal about your character temperament and general outlook on life. Your answers to three simple questions about your name will divulge more than you'd suspect. Here are the questions. After you've answered them read the analysis which follows and see how the experts have figured you out. And after that you can have fun trying the questions on your friends.

1 How do you feel about your first name? Do you feel it fits you—or are you dissatisfied with it?

2 Do you have a peculiar sounding first name?

3 How do you sign your name? Which of these forms do you use?

- John J Brown
- John Brown
- John Jacob Brown
- J J Brown
- J Brown
- J Jacobs Brown

Condensed from Today's Health

**What Your Answers Indicate**

1 Studies conducted at Westminster Wesleyan College show that your attitude toward your given name reflects your attitude toward yourself. The person who is satisfied with his first name tends to be generally pleased but not contented about being the person he is and feels no need to be a different person. But the person who is dissatisfied with his first name tends very definitely to be dissatisfied with the kind of person he is and wants very much to be a different kind of person.

And similar studies at Columbia University likewise show that people who don't feel that their first name fits them are much more given to self-doubts and self-criticism than people who feel their names are all right.

2 Harvard University studies more than 3,300 persons show that people with peculiar first names tend to have a more difficult time

adjusting to the stresses and strains of everyday life than others to be more sensitive and more subject to emotional ups and downs.

Other investigations have similarly shown that a bizarre name can and frequently does have a direct effect on an individual's personality and general life outlook. For example, a name which strikes others as queer or strange or lends itself to jokes or puns can result in a depressive chip on the shoulder or an antisocial attitude. This may occur whether the person thinks his name is him or not.

Psychologists point out that parents who foist an odd name on a child in an attempt to be different may be giving their offspring a difficult burden to cope with as he grows up.

On the other hand, there are some people who thrive on names which would prove a decided handicap to others. A leading social researcher cites the case of a well known personage who feels he gained character by fighting through life with the name Percy.

"My answer," he says, "to those who poke fun at my name is that my mother liked it and that's reason enough why I am always going to use it."

"My son Percy Jr. always said that when he had a son he was going to name him Percy because then he would have to fight every day he was in school and that would make

a man out of him. He now has that son and he is Percy III.

Doctor A. A. Hartman, director of psychology and research at the Psychiatric Institute of Chicago's Municipal Court, has made an intensive study of this matter. He says the way a person signs his name provides a penetrating insight into his character and personality. The following analysis is based on his findings.

**John J. Brown.** This is the conventional American name style. Its use indicates conformity to social customs and an average conventional self concept.

**John Brown.** People who use this form tend to be less conventional in their attitudes than those who include the middle initial. They are likely to be more direct, outspoken and individualistic.

**John Jacob Brown.** Persons who adopt this name form are inclined to have a high opinion of themselves and their abilities and to enjoy being in the limelight. The impression they make on others is important to them and they are likely to take pains to insure making a good appearance. Doctor Hartman notes that when this form is used by persons who are lacking in self-confidence it suggests an attempt to bolster themselves by a demonstrative name display.

**J. J. Brown.** If you use it, it indicates restraint. A desire to keep your feelings and pretty well under wraps, fuss and excitation. It is inclined to be reserved.

to reveal yourself to few people. However, this style may also indicate high energy and impatience, a wish to present only the essentials, a dislike for elaboration.

*J. Brown* The use of a single initial has other connotations and is likely to be used by people who are lacking in self reliance and pessimistic about their own abilities. It tends to go hand in hand with extreme modesty or a desire to escape notice or attention.

*J. Jacob Brown* This style is individualistic and indicates a desire to stand out from the crowd, a striving for distinction or superiority. People in this category aren't likely to underestimate either themselves or their capabilities.

The extent to which you identify yourself with your name also provides an important clue to your personality; that is whether you think of yourself primarily as *yourself*—John Adam *son*—or whether you think of yourself as an architect, a housewife, or a human being.

In a study at the University of California, Berkeley, researchers found that the most common responses to the question "What is your name?" were "I'm John Smith," "I'm a lawyer," "I'm an architect," "I'm an American," or "I'm a working man," to "What do you mean 'who am I?'" and "Why on earth are you asking me such a question?"

The replies ranged from "Why, I'm John Smith," or "I'm a lawyer," or "I'm an architect," "I'm an American," or "I'm a working man," to "What do you mean 'who am I?'" and "Why on earth are you asking me such a question?"

The researchers found that the person who thought of themselves primarily in terms of their names who answered "I'm John Smith" or "Mary Jones" were by far the happiest and had the best adjusted personalities. Such an answer, say the scientists, indicates that the individual has a high degree of self awareness, and is acutely conscious of himself as a person.

And this, of course, has a direct bearing on how well adjusted he is and how well he really knows himself and his innermost wishes and desires.

## Can't Stick to Diet? It's Hospital For You

chest on caloric intake

In re-examining 161 obesity studies reported in the last 30 years, Dr. Alvan R. Feinstein of New York University College of Medicine found that only those patients who were in a completely restricted environment (usually a hospital) always lost weight. In a less restricted environment, even when a prescribed caloric cut was made, whether a special

diet, pills, injections, group therapy, or individual psychiatric help, has worked so consistently, Dr. Feinstein said.

Most overweight persons need some sort of watching to keep an eye on them. In many cases the doctor considers such people a bore. He admonishes them for being fat, gives them a caloric chart, and tells them to eat only so many calories per day.

Doctor Feinstein said the obese person is chronically ill and should be treated accordingly.

## BOOKS

**THE LIVING RIVER** by Isaac Asimov (Anchor \$3.00)

"... keeps each cell supplied with food and air, removes wastes, carries thousands of chemicals, and protects the body against germs and toxins."

**THE COMMON SENSE BOOK OF DRINKING** by Leon D. Adams with foreword by Dr. Morris Fishbein (David McKay \$3.95). Discusses these and many more questions: How much can you hold and stay sober? When are you in danger? Why are martinis deadly? What is the truth about hangovers?

...are ready to use in your own home. A time-tested, medically approved remedies for some 200 ailments and injuries.

**NINE PLANETS** by Alvin E. Nourse (Harper \$5.95). About the nine planets of our solar system, their satellites and their sun, and about the wave of exploration of this solar system which

\$15.00). The first history of thoracic surgery before the 20th century, complete with 155 rare drawings and illustrations has been written by Dr. Hochberg, a Brooklyn, N. Y., thoracic surgeon.

**PLANTS TODAY AND TOMORROW** by Margaret O. Hyde (Whitelsey House, \$3.00). For younger readers this book explains the basic facts about plants and brings the latest information about the exciting frontiers of the plant world.

**THE STORY OF ENGINEERING** by James Kip Finch (Doubleday Anchor \$1.45). A paperback original this book offers in outline survey form the story of a profession which for 50 centuries has exercised an increasing influence on the evolution of our way of life.

**HORN, STRINGS AND HARMONY** by Arthur H. Hinde (Anchor Science Study Series 95 cents). A musician who is also an associate professor of physics at Case Institute of Technology gives a clear and comprehensive account of both the scientific and esthetic nature of music.

**THE MENTALIST** ...

"... will help them to become 'informed parents'."



**THORACIC SURGERY BEFORE THE 20th CENTURY**, by Dr. Lewis A. Hochberg with a foreword by Dr. Edward D. Churchill (Vintner Press

(The books listed above are available from Seneca Falls, and many others, from

(Continued from page 37)

his lenses for hours at a stretch and decided to try them in swimming. "If they'll stay in place while I swim, it really will be great," he told his friends. If—he swam a few strokes under water and came up to find his lenses were gone!

Unfortunately, neither he nor any of his friends could find the tiny clear lenses. Then days passed while he waited for replacement lenses, then he had to get adjusted an hour at a time all over again.

The newer tiny corneal contact lenses, which cover only the curved colored part of the eye, will float off under water. As Don learned later, swimmers who really need glasses can have the older type larger contact lenses which cover the front surface of the eye and are held in place by the eyelids.

GRANDPA ANDREWS was fitted with contact lenses on the advice of his eye doctor. One morning Grandpa felt drowsy after reading the paper, took out his contact lenses and put them in their box in his lap. He fell asleep and his relaxing arm folded the morning paper down over the tiny box.

His daughter tidying up loose papers before the trash man called picked up Grandpa's paper without waking him and put the paper in the trash can.

When Grandpa Andrews awakened he wanted his contact lenses. Where were they? The whole family searched the house for them. "Think hard," his daughter said. "It was the last time you used them."

For the morning paper he suddenly remembered. "I put them in my lap when I finished reading."

His disoriented daughter hurried outside to the trash can. Minutes ahead of the trash man's arrival she found the morning paper with Grandpa's contact lens box folded inside!

Even when complete insurance is carried, prevention of loss of contact lenses is worth intelligent foresight and faithful safety habits.

Briefly, the trick is to put to mind on what you are doing to avoid putting on or removing lenses in locations with obvious danger potential, such as an open drain or busy street or grassy field. You always should put them into their special box, which should look like a special box. If necessary, a large printed label, CONTACT, could be fastened to the top and bottom of the box. The box should be kept in an habitually safe place. If this place is a woman's purse, the purse should be fastened shut. Avoid the open top purse without a fastening from which a little box may fall out without being noticed.

Contact lens insurance isn't a new way to come by easily. Three different companies have said, "We don't want to write contact lens insurance because a policy always means a big

Ruth Bover Scott, a registered nurse and free lance writer, has placed articles with leading publications. Mrs. Scott resides in Bethesda, Md.

Some insurance companies will issue a policy only for those good drivers who already carry major insurance with them.

It may seem logical to the individual who has a 'Homeowner's Policy' covering loss of personal property away from home that such policy should include protection against loss of contact lenses. However, in at least one insurance company the statement was made that contact lenses were not included. If I have a Homeowner's Policy, ask for a written statement in advance setting your contact lenses as to whether they would be covered for loss.

Many optical firms which prepare contact lenses to your ophthalmologist's prescription are able to arrange insurance for you. Some write their own guarantee to replace, others use a commercial insurance company. The fee may be \$15 or

\$25 a year at least one company quotes a \$40 fee for three years, in appreciable saving, over the \$25 rate.

However, if the optical firm to which you consider taking your prescription does not have any insurance accommodation you may find yourself in an awkward situation. Other firms may refuse to insure lenses obtained elsewhere.

Before you decide on insurance, ask the firm which will make up your lenses how much you would be charged to replace one or two lost lenses. The replacement fee will be less than the original cost, probably, and you may decide to carry your own risk of loss because the insurance comes high.

Insured or not insured, if you have strong enough motivation to wear contact lenses, you should add the determination to use your intelligence to prevent their loss!



1. On June 16, 1960, the American Medical Association's House of Delegates meeting in Miami Beach, Florida, went on record as viewing with grave concern the indiscriminate use of contact lenses. Contact lenses involve introduction of a foreign body to the delicate eye tissue and their application is not just a mechanical procedure like fitting spectacles. Their use can lead at times to serious permanent impairment of vision. Dr. Richard L. Grosse of the U.S. Army Medical Corps advised the delegates:

• • • Safety and success in wearing pres-

cription contact lenses require three broad ingredients: an intelligent, cooperative, mature patient who has a genuine need for the lenses and can return for reexamination as frequently as deemed advisable; a skillful, well-trained technician who in addition is capable of recognizing, handling, and immediately referring to an ophthalmologist all complications that may arise; and who has time and is willing to follow patients closely to detect and correct early and a somewhat exaggerated and prolonged lens that is fitted to the individual correctly. Dr. L. Grosse stressed:

*(Continued from page 37)*

his lenses for hours at a stretch and decided to try them in swimming.

If they'll stay in place while I swim, it really will be great," he told his friends. If—he swam a few strokes under water and came up to find his lenses were gone!

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Insured or not insured if you have strong enough motivation to wear contact lenses you should add the determination to use your intelligence to prevent their loss!





## Number of Chromosomes

Sirs

I note in a recent issue that the normal chromosome number in man is 46 not 48. Who discovered this? And when?

JAMES REBOULET  
VERSAILLES OHIO

Until 1957 it was generally believed that there were 48 chromosomes but a more careful count by Dr Masao Kojima of the State University of Iowa showed the count was 46 in the majority of cases —EDITOR

## 'Wretched Businessmen'

Sirs

Just read *Women Are Wretched Housekeepers* (July issue). I refuse to argue with the mechanical mind of a man—he might be right. I am thankful my household is not a machine though.

By the way, some men are wretched businessmen. So what? We love them anyway.

Mrs L. J. WALKER  
HUMBLE TEXAS

## Correction

Sirs

In your June issue there appeared an article entitled "Learn How To Listen" by Eileen I. Daly. This article states that you condensed your article from *This Week Magazine*.

Dr. Walter Stromer of Cornell College Iowa has asked me to look into

CEDAR RAPIDS IO  
We regret the error which led to omission of the name of Dr. Stromer, professor of speech, Cornell College.  
—EDITOR

## Life is Change

Sirs

The article "Has Evolution Stopped?" (July) is a travesty to science. My own view is similar to that of the former head of the patent office who quit his job because he said there

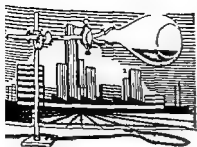
that something would change and evolution. He can't know what will happen in the future.

All of his arguments are very convincing if you forget to look at the problem from a few pages back. Even if the human does not change this evolution because by natural selection will be found that man as he is now is ideal and therefore the mutations will not survive.

ALAN F. SHAPIRO  
BROOKLYN NEW YORK

future (the usual stimulus for evolutionary change) he will use his knowledge and ingenuity to adapt to it rather than undergo bodily evolution. Changes through the process of natural selection? Answering the question: "Has Evolution Stopped?" Dr. Stromer concluded, "Yes and possibly it is."

—EDITOR



## INVENTIONS PATENTS PROCESSES

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### **vacar The Land Vehicle of Slides on Air**

Engineers are now studying the vacar a revolutionary new land vehicle that may someday travel from city to city at 500 mph or more sliding on a thin film of compressed air.

Alex L. Hynek of the Ford Motor Company said his company has already built experimental levacars and is continuing to develop the idea.

In operation levacars carrying a number of passengers are mounted on a tapered track similar to railroad tracks. A stream of compressed air is fed to 'levapads' which fit around the

start landing at their destination. Passengers traveling a few hundred miles may spend much more time traveling

100 mph. Any wheeled vehicle the authors said is unsatisfactory for speeds above 150 mph because of excessive vibration and wear.

Levacars they continued could travel at speeds of 200 to 500 mph over metal rails that would be cheaper and easier to install than conventional roads and would provide added safety as well. This system of sliding on air together with automatic controls they said 'is the foundation of a safe economical high speed transportation substantially independent of weather conditions'.

Fundamentally a levacar is an airplane except that in flying very close to the ground it needs neither wings nor tail surfaces.

'Any lightweight engine is satisfactory as a source of power and the same engine can also be used to provide the compressed air for the levapad,' the authors concluded.

### **Army Foxhole Digger Weighs 36,000 Pounds**

A new machine that digs foxholes in a minute has been developed for the Army but no GI will ever have to carry

a scraper and a discharge conveyor. The machine was developed by the U. S. Army Research and Development Laboratory at Fort Belvoir, Mo.

### **Plastic Boat For Ponds and Pools**

The plastic Sea Falcon is 61 inches long and will float approximately 250 pounds although the boat itself weighs only 14 pounds.



**Sea Falcon**

Sea Falcon is completely encircled by a polyethylene Bumper Float three inches in diameter. According to the distributors, Wilco Fashions of Rockville Centre, New York, this creates the floating buoyancy necessary to prevent tipping and insure safety.

Manufactured from heavy gauge polyethylene, the Sea Falcon is said to be extremely durable.

### **Airlines Testing Air to Ground Phone Service**

Executives flying between major U. S. cities soon may be able to ring up the home office and relay en route reports with the ease of mid-city telephoning. Passengers on coast to coast nonstops may be calling home for little more than it costs to talk from a con-

ventional ground based phone booth, the magazine *Airlift* reports.

Tests of an airborne radio-telephone service have been going on for several months. The Federal Comm-

unications Commission is testing the use of public air to ground operations on a limited number of radio bands.

El Al Israel Airlines recently announced telephone service along all international routes, the magazine noted. For \$3 to \$9 per three minutes, El Al passengers can talk to a number of several dozen ground stations scattered across the globe.

Northwest Airlines, one of the American companies participating in the experimental use of air to ground phone service, found the service overwhelmingly popular. The novelty of making phone calls from 25,000 feet in the air was no small contributor to popularity.

Northwest passengers made calls from a station in the rear of the aircraft. In a full scale implementation of a permanent system, calls probably would be made directly from passengers' seats.

### **Three Dimensional Closed Circuit TV System**

KIN TEL Division of Cohu Electronics Inc. of San Diego, Calif., has developed a three dimensional closed circuit television system.

The system consists of two standard closed circuit cameras and a mounting control console housing two monitors, two camera control units and a single polarized optical system.

The optical system presents the overlapping images from each camera on a single viewing plane, with one image polarized horizontally and one polarized vertically. Observation of this image

oph glasses or a viewing hood with horizontally and vertically polarized lenses provides three dimensional picture presentation

### **Artificial "Dirt" Devised**

#### **Washing Cream Demonstration**

Artificially created dirt applied to toy cars as part of a demonstration for S. C. Johnson & Son, Inc. new car washing cream today.

The artificially dirtied cars, a bottle of the new product and a sponge cloth were sent to editors of various publications for "right at the desk" demonstrations.

According to Johnson's Holiday, the car used without prior washing, the use of a hose is not required. After washing, the cream dries to a haze that is wiped off leaving a bright shine.

### **Printed Tape Stores Musical Scores**

Musical scores may now be stored on punched tape from which they may be duplicated by means of a machine developed by Composers I. A. Heller of the University of Illinois and H. T. Finger of the University of Michigan.

A typist can now simultaneously copy paper computer tape while printing musical notations. The operation is similar to that of a typewriter. Professor Finger is inventor of the new writer, a commercially produced machine which will print musical notation. Heller is best known as a composer for his Illiac Suite, a string quartet consisting of selections from material produced by the University of Chicago high speed computer, "Illiac". He has also composed numerous more orchestral scores.

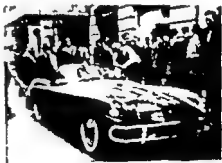
Tape punched on the electronic Musicwriter may be fed back into the machine to print additional copies electrically.

This same tape also can be used as input data for a computer such as Illiac so that with proper directions Heller believes it may be possible for Illiac to extract individual parts for the instruments of the orchestra from the complete score of an orchestral work punched on paper tape by the new machine.

In addition he hopes eventually to get Illiac to perform other burdensome tasks of the composer such as transposing music to another key, transcribing old music into modern notation, design of page format and finally typing the actual musical score.

### **Low Cost Fiberglass Sports Car Body**

Sports car enthusiasts will be interested in the Conquest, a fiberglass auto body designed by La Dauri Concheristi and being distributed by the International Fiberglass Corp. of New York.



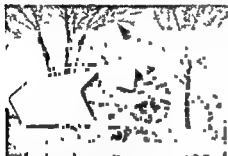
**La Dauri Conquest**

Three different types of Conquest body kits are available and a complete sports car can be constructed for little as \$700 to \$800 according to Motor Life.

The chassis and other parts of the car can be built from spare parts available in used car lots or junk yards. Finished cars with the Conquest body and Corvette or Duntov Chevrolet motors are also available from the company.

### **Golf Car's Tires Save Grass**

The Goodyear Tire & Rubber Co. of Akron, Ohio, has come up with soft cylindrical Terra Tires for golf cars. According to the company, a golf car equipped with Terra Tires can be parked on a green and the indentation would be less than that from a man's footsteps.



**Car With Terra-Tires**

The special tires are said to provide high flotation, thus eliminating costly damage to golf courses even on soggy terrain.

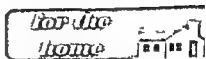
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ater lover appealed to candy manufacturers to come up with a package silent enough to take to the theater.

The New York Times reports that John Hare, Minister of Agriculture, Fisheries and Food, called upon the candy industry to devise a wrapping that could be opened and discarded

without making so much noise that voices on stage were drowned out.

'There is nothing more infuriating during a critical part of the play than to hear someone unwrapping a box of chocolates,' Hare told a meeting of the Cocoa, Chocolate and Confectionery Alliance.



### **Develop Naturally Colored Pink Grapefruit Juice**

Naturally colored pink grapefruit juice has been developed by U. S. Department of Agriculture scientists. In the process of making the juice, some of the pink-colored pulp from the grapefruit is finely ground and added. Juice made in this manner does not have the muddy appearance of colored grapefruit juice made by conventional methods.

The new juice also has a higher content of carotene, a substance the body converts into vitamin A.

### **Vacuum Cleaner For Phonograph Records**

'Vacu-Magic,' a vacuum cleaner for phonograph records, has been developed by the General Electric Company.

According to the company, dust and dirt particles are the worst enemies of long playing records. The company has incorporated a small powerful vacuum cleaner, which operates as the record is playing, into some of its new phonographs.

A soft brush is installed just ahead of the record needle. The brush picks up dirt out of the grooves. This dirt is silently sucked into a tube running through the phonograph tone arm and

to the cabinet interior to be accumulated in a container.

### periments With Water for Young Scientists

Cold tap water is the primary ingredient for the A. C. Gilbert Company's Fluid Dynamics Lab set. It is said to be the first set available to teach young scientists the principles of water science.

With the set, a youngster finds out how water behaves under the pressures of air or gravity. He can make water siphons, force pumps and perform experiments in diffusion, convection, specific gravity and air pressure versus water pressure.

A Turbine Generator Kit demonstrates to youngsters how water power is used to produce electricity. Water in a faucet turns a water wheel which moves a magnet next to a coil of wire to generate 6 to 12 volt alternating current. The current rings a bell included in the kit. The kit is distributed by the Product Design Co. of Redwood City, Calif.

### Plastic Planetarium Projects Stars

Young astronomers will enjoy a new planetarium that accurately projects more than 60 constellations on the walls and ceiling of any darkened room, with proper compensation for both time and space.

The stars are projected as pin points of light through holes in a plastic star sphere. By means of two adjustments on its supporting base, the star sphere can be positioned to project the constellations as they appear in any latitude in the Northern Hemisphere in any season.

Accessory equipment projects mythi-

cal constellation figures over the stars, which are shown in their proper order of magnitude. Other accessories trace the paths of Saturn and Sputnik and simulate six types of solar and lunar eclipses.



**Plastic Planetarium**

Called the Spitz Junior Planetarium, the device is manufactured by the Harmonic Reed Corp. of Rossmont, Pa.

A star sphere to project the heavens as they appear in the Southern Hemisphere is available separately.

### ADDRESSES

Send 10¢ to: That Cat's paw for: Harvey A. C. Gilbert, Department A-511, P.O. Box 100, New York 15, N.Y. For: Fluid Dynamics Lab set, \$1.95; Turbine Generator Kit, \$1.95; Plastic Planetarium, \$1.95; Star Sphere, \$1.95; Accessory equipment, \$1.95. International correspondence: 412 Madison Ave., New York 17, N.Y. Telephone: CO 4-1000.

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# Twenty-three Years Ago

## In Science Digest

**Cyclotron** —New Research Tool The cyclotron developed by Dr. E. O. Lawrence and associates at the University of California has far exceeded expectations. With this instrument, ions of heavy hydrogen have been produced with energies of over five million electron volts. As regards the much discussed useful liberation of nuclear energy, this does not yet appear to be in sight.

1937

**Men and Women Drivers** —Proof that the average man drives faster than the average woman was found in an AAA survey, which disclosed that men drivers claimed an average of 47 miles per hour on the road, while women drivers claimed an average of 44.7 mph.

1937

**Worry and Ulcers** : Worry is causing peptic ulcers both among millionaires and unemployed, declared Dr. Heinrich Necheles of Chicago before the American Gastro-Enterological Association. A millionaire worries about his life and the unemployed man about a job. Men are affected by peptic ulcers more than women, in a ratio of 10 to 1.

1937

**Air Conditioning** —By the end of 1937, \$85 million worth of air conditioning apparatus will have been sold, an increase of 60 percent over the sales of 1936. Optimists predict that by 1945 no office building or factory, and no home costing more than \$6,000 will be without its year-round air conditioning plant.

1937

**Radio Cooking** —Radio short waves may be used for cooking food in ice. An Austrian physicist put a large piece of raw beefsteak into water and froze it into a cake of ice. When the radio short waves had been turned on, the beefsteak was cooked to a turn—inside the block of ice.

1937

**TV's Biggest Question** —Lenox R. Lohr, NBC president, says the biggest economic question confronting television is "Will it be commercial when it comes?" and "How well will television sell goods?"

1937

Designers of the 1939 New York World's Fair are reported to be experimenting with fluorescent paints that will make exterior walls pastel shades of color at night.





